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SESOURCESRESOURCES ABSTRACTS



VOLUME 7, NUMBER 15 AUGUST 1, 1974 SELECTED WATER RESOURCES ABSTRACTS is published semimonthly for the Water Resources Scientific Information Center (WRSIC) by the National Technical Information Service (NTIS), U.S. Department of Commerce. NTIS was established September 2, 1970, as a new primary operating unit under the Assistant Secretary of Commerce for Science and Technology to improve public access to the many products and services of the Department. Information services for Federal scientific and technical report literature previously provided by the Clearinghouse for Federal Scientific and Technical Information are now provided by NTIS.

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SELECTED WATER RESOURCES ABSTRACTS

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Resources Research, U.S. Department of the Interior



VOLUME 7, NUMBER 15 AUGUST 1, 1974

W74-07601 -- W74-08150

The Secretary of the U. S. Department of the Interior has determined that the publication of this periodical is necessary in the transaction of the public business required by law of this Department. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1978.

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.

FOREWORD

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the Water Resources Thesaurus. Each abstract entry is classified into ten fields and sixty groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCU-MENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by coordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstracting, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the BioScience Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Resources Research and other Federal water resources agencies with which the

Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center Office of Water Resources Research U.S. Department of the Interior Washington, D. C. 20240

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04 WATER QUANTITY MANAGEMENT AND CONTROL

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07 RESOURCES DATA

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08 ENGINEERING WORKS

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09 MANPOWER, GRANTS, AND FACILITIES

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SELECTED WATER RESOURCES ABSTRACTS

1. NATURE OF WATER

1B. Aqueous Solutions and Suspensions

ADHESION OF ICE FROZEN FROM DILUTE ELECTROLYTE SOLUTIONS, Cold Regions Research and Engineering Lab., Hanover, N.H. For primary bibliographic entry see Field 2C. W74-07618

2. WATER CYCLE

2A. General

THE METHODOLOGY OF BAYESIAN IN-FERENCE AND DECISION MAKING APPLIED TO EXTREME HYDROLOGIC EVENTS, Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.

F. Wood, I. Rodriguez-Iturbe, and J. C.

Schaake

Available from the National Technical Information Service as PB-232 009, \$6.75 in paper copy, \$1.45 in microfiche. Ralph M. Parsons Laboratory for Water Resources and Hydrodynamics, Techni cal Report No 178, January 1974, 297 p, 56 fig, 42 tab, 50 ref. OWRR/C-4118(No 9021)(2).

Descriptors: Floods, Rainfall-runoff relationships, Model studies, *Risks, *Decision making, Rhode Island, *Flood discharge, *Flood frequency, *Flood protection, Flood damage, Statistical methods, Statistical models. Identifiers: *Bayesian analysis.

This study presents the methodology of Bayesian Ihis study presents the methodology of Bayesian inference and decision making applied to extreme hydrologic events. Inference procedures must consider both the natural or 'modelled' uncertainty of the hydrologic process and the statistical uncertainty due to a lack of information. Two types of statistical uncertainty were considered. The first type is the uncertainty in modelling the hydrologic process and the second type is the uncertainty. hydrologic process, and the second type is the un-certainty in the values of the model parameters. The uncertainty is reduced by considering prior sources of information (regional regression, theoretical flood frequency analysis or subjective assessment) and historical flood data. A 'Bayesian distribution' of flood discharges is developed that fully accounts for parameter uncertainty. In an analogous manner, model uncertainty is analyzed, which leads to a 'composite Bayesian distribution'. The uncertainty in flood frequency curves from rainfall-runoff models is also analyzed, due to the uncertainty in the parameters of the models. The Bayesian inference model is then applied to a Bayesian decision model, where the decision rule is the maximization of expected net monetary benefits. A case study of determining the optimal size of local flood protection for Woonsocket, Rhode Island, was considered, using realistic flood damage and cost functions. The results indicate that Bayesian inference procedures can be used to fully account for statistical uncertainty and that Bayesian decision procedures provide a ra-tional approach for making decisions under uncertainty. W74-07601

A STREAMFLOW MODEL FOR METROPOLITAN PLANNING AND DESIGN, Metropolitan Sanitary District of Greater Chicago,

R. F. Lanyon, and J. P. Jackson.

Available from National Technical Information Service as PB-232 181, \$3.75 in paper copy, \$1.45 in microfiche. American Society of Civil En-gineers, New York, N.Y., Urban Water Resources

Research Program Technical Memorandum No 20, January, 1974, 49 p, 4 tab, 18 fig, 4 ref. OWRR C-4048(9009)(3). 14-31-0001-9009.

Descriptors: *Computer models, *Urbanization, *Streamflow, *Drainage systems, *Project planning, *Design, *Storm runoff, Surface runoff, Rainfall-runoff relationships, Flood routing, Flood protection, Remote control, Cities, Mathematical models, *Illinois.

Identifiers: *Metropolitan studies, *Storm sewers, *Combined sewers, Urban areas, *Chicago(III).

The mathematical model described is quite unusual. While sufficiently simple and flexible to serve as a planning tool, it is adequately detailed for use in at least preliminary design. Developed The Metropolitan Sanitary District of Greater Chicago, the computer program has been em-ployed by the MSD in the analysis of streamflows and sewer systems and for sizing several reservoirs. That it was developed by an operating agency and not a research organization is particularly significant. A disadvantage of the present version of the model is that it does not include provision for generating water quality characteristics. Using the model, adequate approximations of observed hydrographs for several catchments in the Chicago region were obtained without modification of the programming or the constants involved. The model appears to have a good potential for satisfactory application to watersheds in other satisfactory application to watersheds in other parts of the country with possible alteration of the constants being the only change necessary. The computer program in the form of a FORTRAN IV card deck is available. (McPherson-ASCE) W74-07721

ALTERATIONS IN THE HYDROLOGIC CYCLE INDUCED BY URBANIZATION IN NORTHERN NEW CASTLE COUNTY, DELAWARE: MAGNITUDES AND PROJECTIONS,

Delaware Univ., Newark. For primary bibliographic entry see Field 4C. W74-07729

HYDROLOGICAL ASPECT OF SURFACE RUN-OFF.

Jadavpur Univ., Calcutta (India). B. Bose, and M. Bandyopadhyay. Science and Culture, Vol 39, No 6, p 248-252, June, 1973. 1 fig. 1 tab, 5 ref.

Descriptors: *Hydrologic aspects, *Surface runoff, *Model studies, *Rational formula, Rainfall intensity, Frequency analysis, Estimating equations, *Runoff forecasting. Identifiers: *India(Calcutta).

The problems associated with the hydrologic aspect of surface runoff with particular reference to the city of Calcutta, India are discussed briefly. A model based on rainfall-intensity-frequency was obtained from the available data. This model then was used to estimate the runoff by the rational method. (Sanduski-Franklin) W74-07756

DOCUMENTATION OF PROSPER - A MODEL OF ATMOSPHERE-SOIL-PLANT WATER FLOW,

FLOW, Oak Ridge National Lab., Tenn. R. A. Goldstein, J. B. Mankin, and R. J. Luxmoore.

Available from NTIS, Springfield, Va., as Rept. No. EDFB-IBP-73-9; \$5.45 per copy, \$1.45 microfiche. Report No. EDFB-IBP-73-9, February 1974. 76 p, 1 fig, 23 ref.

Descriptors: *Model studies, *Hydrologic models, *Hydrologic data, *Hydrologic cycle, At-mosphere, Soils, Soil-water-plant relationships. Water balance, Phenology, Ecology, Ecosystems, Evapotranspiration, Vegetation, Flow, Precipita-tion, Pacifylous forest. Computer programs tion, Deciduous forests, Computer programs.

1

A phenomenological model, PROSPER, has been developed that simulates atmosphere-plant-soil moisture relations on a day-to-day basis. The model is explained in detail, and a computer program of the model is listed. Computer output resulting from an application of PROSPER to a forested watershed is also presented. This report has been produced with the sole objective of documentation and no attempt is made to interpret the results of the application which is included. (Houser-ORNL)
W74-07785

HYDROLOGIC MODELS OF THE GREAT

LAKES, State Univ. of New York, Buffalo. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2H. W74-07826

GROUND-WATER QUALITY MODELS: WHAT THEY CAN AND CANNOT DO,

Water Resources Engineers, Inc., Walnut Creek,

For primary bibliographic entry see Field 5B. W74-07933

APPLICATION OF REMOTE SENSING TO HYDROLOGY-FINAL TECHNICAL REPORT. IBM Electronics Systems Center, Huntsville, Ala. R. Ambaruch, and J. W. Simmons. September 1973. 104 p. 32 fig, 17 tab, 18 ref, 3 append. NASA Contract NAS8-14000/SA 2171.

Descriptors: *Remote sensing, *Mathematical models, *Rainfall-runoff relationships, Tennessee, Data collections, Hydrologic data, Aerial photography, *Model studies, Small watersheds, Computer programs, *Simulation analysis, Computer programs, Watersheds(Basins). Identifiers: *Tennessee River Valley.

Data produced by remote observation from space and aircraft were tested for use in reducing the and arcraft were tested for use in reducing the time and expense normally involved in predicting the hydrological behavior of an ungaged watershed. Such a capability can enhance effec-tive planning for urban and industrial develop-ment, flood control, hydroelectric power, navigament, flood control, hydroelectric power, naviga-tion, and water resources management. The con-tinuous simulation model chosen for the study is the Kentucky Watershed Model (KWM). This model is based upon the Stanford Watershed Model IV, adapted and refined for application to this project. The area from which test watersheds are chosen for the study is the Tennessee River Valley, a major watershed of approximately 104,000 sq kms in the southeastern United States. This is a well-instrumented, throughly photographed and mapped area for which copious histori-cal data records are available. The remote sensing imagery used to determine watershed physical characteristics was actually aerial photographs, mostly at a scale of 1:24,000. The five validation runs produced simulated streamflows which corre-lated remarkably well with observed streamflow. Daily correlation coefficients ranged from 0.83 to 0.87; monthly, from 0.92 to 0.97. Many major storms were reasonably well matched with respect to peak flows and timing of peaks. For a multiyear open-loop simulation, this is adequate for most applications, and it strongly indicates the feasibility of using remotely sensed data to forecast the hydrologic performance of an ungaged watershed. (Knapp-USGS) W74-07940

INTERNATIONAL COOPERATION HYDROLOGISTS (MEZHDUNARODNOYE SOTRUDNICHESTVO GIDROLOGOV), Gosudarstvennyi Gidrologicheski Institut, Lenin-

grad (USSR). For primary bibliographic entry see Field 7A. W74-08047

Group 2A-General

NATIONAL WEATHER SERVICE RIVER FORECASTING SYSTEM,

National Oceanic and Atmospheric Administration, Silver Spring, Md. Office of Hydrology. For primary bibliographic entry see Field 4A.

2B. Precipitation

PRECIPITATION CHARACTERISTICS OF THE NORTHERN NEW JERSEY, NEW YORK CITY METROPOLITAN AREA, Rutgers-The State Univ., New Brunswick, N.J.

A. R. Greenway.

Available from the National Technical Information Service as PB-231 981, \$7.00 in paper copy, \$1.45 in microfiche. M Sc Thesis, May 1972. 71 p, 26 fig, 9 tab, 27 ref. OWRR B-044-NJ(2). 14-31-0001-3615.

Descriptors: *Precipitation, *Meteorological data, *Rainfall disposition, *Weather patterns, *Rainfall disposition, *Weather patterns, *Temporal distribution, Rain, Local precipitation, Meteorology, Climatology.

The precipitation process in the New York metropolitan area has been studied from physical and synaptic points of view. Influences of topography and urban growth have been considered. Relevant synaptic conditions include extra tropical cyclones and air mass thunderstorms. With these controlling factors in mind, monthly and annual precipitation characteristics were analyzed for trends and variability. The area of maximum decade mean precipitation has been shown to be moving eastward, possibly under the influence of increasing population and industrialization. However, no large urban-induced maximum appears to be present. W74-07607

METEOROLOGICAL AND HYDROLOGICAL INVESTIGATIONS.

For primary bibliographic entry see Field 5B. W74-07658

THE SIGNIFICANCE OF RAINFALL ON SALT AND SODIUM ACCUMULATIONS UNDER IR-

South Dakota State Univ., Brookings. Dept. of Plant Science. For primary bibliographic entry see Field 3C.

W74-07743

PROJECT SKYWATER 1972 ANNUAL RE-

Bureau of Reclamation, Denver, Colo. Office of Atmospheric Water Resources. For primary bibliographic entry see Field 3B. W74-07928

SOME CLIMATOLOGICAL CHARAC-TERISTICS OF SEEDABLE UPSLOPE CLOUD

SYSTEMS IN THE HIGH PLAINS, National Oceanic and Atmospheric Administration, Boulder, Colo. Environmental Research Labs

For primary bibliographic entry see Field 3B. W74-07929

2C. Snow, Ice, and Frost

ADHESION OF ICE FROZEN FROM DILUTE ELECTROLYTE SOLUTIONS. Cold Regions Research and Engineering Lab.,

Hanover, N.H. H. H. G. Jellinek.

Research Report 317, March 1974. 8 p, 3 fig, 2 tab, 10 ref.

Descriptors: *Ice, *Cryology, *Adhesion, Freezing, *Electrolytes, Crystallography, Deicers, ing, *Electrol Snow removal.

The adhesion of ice frozen from a number of electrolyte solutions to a wax-treated aluminum surface was tested at -10 deg C. The adhesive strength measured by the stress needed to shear the ice off the substrate surface is mainly due to a liquid interfacial solution layer between the ice and the substrate surface. The thickness of such a layer is largely determined by the same considerations as the thickness of grain boundary layers in ice obtained from dilute electrolyte solutions. (Knapp-USGS) W74-07618

HYDROLOGIC RESPONSE OF ICE-COVERED

STREAMS, Iowa Univ., Iowa City. Inst. of Hydraulic Research.

For primary bibliographic entry see Field 2E. W74-07832

APPLICATION OF ELECTRICAL ENERGY TO CULVERT ICING PROBLEMS--A LABORATO-RY STUDY,

Cold Regions Research and Engineering Lab., Hanover, N.H. For primary bibliographic entry see Field 8C.

W74-07909

ISUA, GREENLAND: GLACIOLOGICAL IN-VESTIGATIONS DURING 1973,

Cold Regions Research and Engineering Lab., Hanover, N.H. S. C. Colbeck, and A. J. Gow.

Research Report 318, March 1974. 13 p, 8 fig, 1 tab. 9 ref.

*Glaciology, Descriptors: *Glaciohydrology, *Glaciology, Glaciers, Melt water, Boreholes, Ice, Core drilling, Mining.
Identifiers: *Greenland(Isua).

Two holes were drilled through the Greenland ice sheet during 1973, and temperature measurements were made in one hole drilled during 1972. These measurements show that the area of liquid water beneath the ice cap extends to ice depths as shallow as 100 m. The consequences of removing the frozen margin of glacial ice could be serious. Petrographic studies of a few ice cores revealed a strongly oriented crystal fabric and an appreciable surface accumulation of superimposed ice.
(Knapp-USGS)
W74-07910

ICELANDIC GEOTHERMAL ACTIVITY AND THE MERCURY OF THE GREENLAND

Hawaii Univ., Honolulu. Dept. of Microbiology. For primary bibliographic entry see Field 5B. W74-07944

APPLICATION OF SATELLITE DATA FOR HYDROLOGIC PURPOSES (ISPOL'ZOVANIYE SPUTNIKOVOY SPUTNIKOVOY INFORMATSII GIDROLOGICHESKIKH TSELEY), DLYA Gosudarstvennyi Gidrologicheski Institut, Lenin-

grad (USSR).
For primary bibliographic entry see Field 7B.
W74-08049

2E. Streamflow and Runoff

HISTORIC FLOOD INFORMATION FOR NORTHERN CALIFORNIA STREAMS FROM GEOLOGICAL AND BOTANICAL EVIDENCE, Geological Survey, Washington, D.C. E. J. Helley, and V. C. LaMarche, Jr.

For sale by Sup Doc, GPO, Washington, D.C. 20402, Price \$1.45. Professional Paper 485-E, 1973. 16 p, 7 fig, 1 tab, 27 ref.

Descriptors: *Historic floods. *California *Sedimentation, *Sedimentary structures, Stratigraphy, Dating, Radioactive da Dendrochronology, Floods, Flood frequency.

Severe flooding in the mountainous region of northern California has produced texturally and morphologically distinct gravel deposits. Study of erosion and deposition produced by the devastating floods of December 1964 allowed comparison and identification of ancient flood deposits. Long-lived coniferous trees, both living and those killed by the 1964 floods, were used to assign minimum ages to these deposits. Maximum ages were determined on the basis of radiocarbon dating of material entrained in the same deposits. Comparison with historic records at the four detailed study sites suggests that severe floods of magnitude similar to that of December 1964 have occurred several times in the last few hundred years. (Knapp-USGS) W74-07646

WATER RESOURCES DATA FOR NEBRASKA, 1972: PART I. SURFACE-WATER RECORDS, Geological Survey, Lincoln, Nebr. For primary bibliographic entry see Field 7C. W74-07647

CHESTER RIVER STUDY, VOLUMES I. II. AND III.

For primary bibliographic entry see Field 5B. W74-07653

EVOLUTION OF MEANDER LOOPS, Washington Univ., St Louis, Mo. Dept. of Earth Sciences. For primary bibliographic entry see Field 2J.

ESTIMATING THE MAGNITUDE OF PEAK DISCHARGES FOR SELECTED FLOOD FREQUENCIES ON SMALL STREAMS IN EAST

Geological Survey, Austin, Tex. E. E. Schroeder.

W74-07661

Open-file report, Febraury 1974. 16 p. 4 fig, 2 tab,

Descriptors: *Floods, *Texas, *Stage-discharge relations, *Peak discharge, Flood frequency, Flood recurrence interval, Regression analysis.

Peak-discharge data from 28 stream-gaging stations with long-term records (10-33 years) and 60 stations with short-term records (less than 10 years) were used in multiple linear-regression procedures to obtain equations for estimating the peak discharge of floods with recurrence intervals of 10, 25, and 50 years on small rural streams in East Texas. The significant independent variables were drainage area, channel slope, and channel length. The relationships are presented in nomographs that can be used for estimating the peak discharges on small streams for floods of the selected recurrence intervals, provided that the magnitude of the independent variables is within the range of those used to develop the relation-ships. (Knapp-USGS) W74-07664

ANNUAL PEAK DISCHARGES FROM SMALL DRAINAGE AREAS IN MONTANA, THROUGH

SEPTEMBER 1972, Geological Survey, Helena, Mont. M. V. Johnson, and R. J. Omang. Open-file report, 1973. 141 p, 1 fig.

Streamflow and Runoff-Group 2E

Descriptors: *Peak discharge, *Small watersheds, *Montana, Water levels, Stage-discharge rela-tions, Data collections, Hydrologic data, Floods, Flood forecasting, Gaging stations.

Annual peak stage and discharge at each crest-stage gaging station in Montana are tabulated. At gaging station one or more standard Geologieach gaging station one or more standard Geological cal Survey crest-stage gages record the maximum stage reached by the water surface. Throughout the 1972 water year, 182 gages were in operation. The gaging stations provide information on drainage areas that range in size from less than I square mile to several hundred square miles and that represent various hydrologic conditions. The network presently has 24 stations having drainage areas less than 1 sq mi, 92 stations having from 1 to 10 sq mi, 50 stations having from 10 to 50 sq mi, and 16 stations having more than 50 sq mi. (Knapp-HSGS) W74-07667

DRAINAGE AREA AND RIVER MILEAGE OF NEBRASKA STREAMS: PART 1--SALT AND WEEPING WATER CREEKS, BIG AND LITTLE NEMAHA RIVERS, AND MINOR STREAMS IN SOUTHEASTERN NEBRASKA.

Geological Survey, Lincoln, Nebr G. G. Jamison. Open-file report 7404, April 1974. 111 p, 6 fig.

*Drainage Descriptors: area. *Watersheds(Basins), *Nebraska, Hydrologic data, River basins, Drainage density, Drainage patterns(Geologic).

Drainage areas and river mileages for streams in southeastern Nebraska drainage basins are presented in two tables. The first table for each basin is a list of distances in river miles above stream mouth and corresponding drainage areas for selected sites and features. The second table is for selected sites and features. The second table is a list of distances above stream mouth for all contour-line crossings as shown on 7 1/2-minute topographic quadrangles. In addition to giving the name of the stream basin, the heading of each table indicates in parentheses the rank of the stream in relation to those of higher rank within the Missouri River basin. (Knapp-USGS)

QUALITY OF SURFACE WATERS IN THE COLORADO RIVER BASIN, TEXAS, 1966-72 WATER YEARS,

Geological Survey, Austin, Tex. For primary bibliographic entry see Field 5B. W74-07670

HETEROGENEITIES IN SALINITY IN A RIVER

PLUME, Delaware Univ., Newark. Coll. of Marine Studies. For primary bibliographic entry see Field 2L. W74-07672

A SIMPLE, SEGMENTED PRISM MODEL OF TIDAL MIXING IN WELL-MIXED ESTUARIES, Institute of Oceanographic Sciences, Taunton For primary bibliographic entry see Field 2L.

A SIMILARITY SOLUTION FOR STEADY-STATE GRAVITATIONAL CIRCULATION IN FJORDS, Washington Univ., Seattle. Dept. of Oceanog-

For primary bibliographic entry see Field 2L. W74-07675

THE 7-DAY 10-YEAR LOW FLOWS OF IL-LINOIS STREAMS, Illinois State Water Survey, Urbana. K. P. Singh, and J. B. Stall.

Bulletin 57, 1973. 24 p, 12 fig, 15 tab, 39 ref.

Descriptors: *Low flow, *Illinois, Streamflow forecasting, Data collections, Hydrologic data, aste dilution, Water pollution control.

Low flow values expected for a 7-day period at a recurrence interval of 10 years are given at inter-vals along the course of each stream in Illinois. These flows are useful for calculating the instream dilution available for waste-water ef-fluents. Flow records from 266 stream-gaging stations were the primary data used. The amount of effluent waste-water flow during low-flow periods was obtained for about 300 existing waste-water treatment plants now discharging into Illinois streams. These locations and flow amounts are shown on maps. The hydrologic effects of natural lakes, manmade lakes, gains and losses from groundwater, navigation dams, and evaporation from the river surface are considered. The timing, or season, of the 7-day 10-year low flows is described. The special cases of the controlled waterways within the Metropolitan Sanitary District of Greater Chicago, the Illinois River, the Mississippi River, and the Ohio River are also described. (Knapp-USGS) W74-07677

OUALITY OF SURFACE WATER IN ILLINOIS. 1966-1971, Illinois State Water Survey, Urbana

For primary bibliographic entry see Field 5A. W74-07678

ALTERATIONS IN THE HYDROLOGIC CYCLE INDUCED BY URBANIZATION IN NORTHERN NEW CASTLE COUNTY, DELAWARE: MAG-NITUDES AND PROJECTIONS,

Delaware Univ., Newark. For primary bibliographic entry see Field 4C. W74-07729

THE NUMERICAL SOLUTION OF TRANSIENT SUPERCRITICAL FLOW BY THE METHOD OF CHARACTERISTICS WITH A TECHNIQUE FOR SIMULATING BORE PROPAGATION, Georgia Inst. of Tech., Atlanta. Environmental

Resources Center. For primary bibliographic entry see Field 8B. W74-07732

HYDROLOGY AND STRUCTURAL DESIGN (IN RUSSIAN),

For primary bibliographic entry see Field 8B. W74-07767

HYDROLOGIC RESPONSE OF ICE-COVERED

Iowa Univ., Iowa City. Inst. of Hydraulic Research.

P. P. Paily, E. O. Macagno, and J. F. Kennedy. Available from the National Technical Service as PB-232 212, \$3.25 in paper copy, \$1.45 in microfiche. Iowa Water Resources Research In-stitute, Ames, Completion Report ISWRRI-56, June 1973, 34 p, 9 fig, 1 tab, 13 ref. OWRR B-018-IA(1). 14-31-0001-3280.

Descriptors: *Hydrodynamics, *Rivers, Temperature, *Thermoelectric power, Ice, Mathematical models, Heat transfer, *Thermal pollution, Waste disposal, Dispersion, Heat exchangers, Convections, the control of the cont

tion, *Illinois.
Identifiers: Cordova(III), *Temperature distribu-

The increase in water temperature in natural streams due to waste heat disposal from thermal power plants leads to extensive ice-free reaches during winter periods. Once the hot water is completely mixed with the streamflow, the tem-perature distribution in the stream is mainly con-

trolled by the surface heat exchange between water and the atmosphere: the mathematical formulation of the temperature distribution is represented by the one-dimensional convection-diffusion equation. Generally, the surface heat exchange between water and the atmosphere is a complex function of the water temperature; however, it is shown that it can be expressed, for most ever, it is snown that it can be expressed, for most practical purposes, as a linear function of the water temperature. Using this approximation a closed-form solution of the one-dimensional unsteady convection-diffusion equation is developed to predict temperature distributions in streams and the lengths of ice-free reaches downstream from the thermal discharge sections. W74-07832

DATA ON FRESH-WATER INFLOW, APRIL 14-JULY 28, 1973, FOR ANALOG-MODEL STUDY OF THE HOUSTON SHIP HOUSTON, TEXAS, CHANNEL.

Geological Survey, Houston, Tex. For primary bibliographic entry see Field 7C. W74-07921

TRANSIT LOSSES AND TRAVEL TIMES FOR RESERVOIR RELEASES, UPPER ARKANSAS RIVER BASIN, COLORADO, Geological Survey, Denver, Colo.

For primary bibliographic entry see Field 4A. W74-07931

TRENDS AND PROBLEMS IN INVESTIGATION OF LONG-TERM FLUCTUATIONS OF RIVER RUNOFF (NAPRAVLENIYA I ZADACHI ISS-LEDOVANIYA MNOGOLETNIKH KOLEBANIY

Akademiya Nauk SSSR, Moscow. Institut Vodnykh Problem

S. N. Kritskiy, M. F. Menkel', and D. Ya.

Meteorologiya i Gidrologiya, No 10, p 55-62, October 1973. 26 ref.

Descriptors: *Runoff. *Streamflow Discharge(Water), *Fluctuations, *Statistical methods, Correlation analysis, Stoc processes, Markov processes. Identifiers: *USSR, Probability distribution.

The present state of science in the field of prediction and description of fluctuations of river runoff was investigated in light of the problems of engineering hydrology. Studies of probability laws in long-term runoff fluctuations can be divided into three basic parts: (1) establishment of probability distribution types expressing the recurrence rate of runoff values; (2) estimation of numerical parameters individualizing distributions as applied to individual basins and runoff characteristics; and (3) expression of autocorrelation functions which reflect a tendency toward formation of extended periods of increased and reduced water discharges. Further studies are needed to (1) improve methods and technical procedures for effective evaluation of probability distribution parameters: (2) study of distributions of errors of a sample estimate of parameters and quantiles in the application of effective evaluation methods; and (3) improve methods for a combined analysis of observations on the basis of sets of analog basins. Basic objectives of future investigations include: (1) refinement of the type of correlation and of the type and parameters of conditional probability distributions of annual runoff; (2) detailed analysis of relations between discharges of successive years on rivers with small runoff; (3) study of the laws of runoff variability of lacustrine rivers; and (4) testing and further investigation of hypotheses on the causes of occurrence of stochastic relations between runoff of successive years. (Josefson-

Group 2E-Streamflow and Runoff

NATIONAL WEATHER SERVICE RIVER FORECASTING SYSTEM,

National Oceanic and Atmospheric Administration, Silver Spring, Md. Office of Hydrology. For primary bibliographic entry see Field 4A. W74-08057

DAM COLLAPSE WAVE IN A RIVER,

Tippetts-Abbett-McCarthy-Stratton, New York. A. Balloffet, E. Cole, and A. F. Balloffet. Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HYS, Paper 10523, p 645-665, May 1974. 13 fig, 1 tab, 10 ref, append.

Descriptors: *Flood waves, *Dam failure, *Mathematical models, Bores, Flood control, Flood protection, Numerical analysis, *Computer programs

programs.
Identifiers: *Morocco(Bou Regreg Dam).

Dam failure flood waves may be solved by numerical analyses made with the use of computer programs which calculate propagation of transient flow. The continuity equation is written for the node instead of the link. This allows the analysis of more complex networks. The hypothetical gradual collapse of the cofferdam of the Bou Regreg Dam in Morocco was studied to assist in the preparation of emergency plans. These results are compared to those of an instantaneous collapse of the same project and of a dam in a rectangular channel. (Knapp-USGS)

HYDROLOGICAL INVESTIGATIONS IN FOREST.

Akademiya Nauk SSSR, Moscow. Laboratoriya Lesovedeniya. For primary bibliographic entry see Field 4C. W74-08140

2F. Groundwater

PACKING-INDUCED RADIAL PARTICLE-SIZE SEGREGATION: INFLUENCE ON HYDRODYNAMIC DISPERSION AND WATER TRANSFER MEASUREMENTS, Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 2G.

PLANNING A DOMESTIC GROUNDWATER SUPPLY SYSTEM, Illinois State Water Survey, Urbana.

Illinois State Water Survey, Urbana. For primary bibliographic entry see Field 4B. W74-07639

GROUND-WATER RESOURCES OF MONT-GOMERY COUNTY, INDIANA, Geological Survey, Washington, D.C. L. W. Cable, and T. M. Robison.

L. W. Cable, and T. M. Robison.
Indiana Dept. of Natural Resources, (Indianapolis), Division of Water, Bulletin No 36, 1974. 20 p. 4 fig, 4 tab, 16 ref, append.

Descriptors: *Hydrogeology, *Indiana, Water sources, Aquifers, Groundwater, Water quality, Water yield, Shales, Sandstones, Glacial drift, Allumium.

Identifiers: *Montgomery County(Ind).

Both consolidated bedrock and unconsolidated deposits contain significant water-bearing zones which may serve as a water supply in Montgomery County, Indiana. The uppermost part of the consolidated rocks consist of a wide variety of lithologic types, with shale predominating. Shales and siltstones of the Bordon Group of Mississippian age are the best aquifers. All rock types yield ample domestic supplies and in some places yield supplies adequate for small to moderate municipal

or industrial needs. The maximum reported yield from the consolidated rock is 270 gpm. The chief aquifers in the unconsolidated rocks are the sand and gravel beds of the glacial outwash deposits. Valley-train aquifers in buried bedrock valley-offer the best potential for large municipal or industrial supplies. Water in both the unconsolidated rocks and in the shallow consolidated rocks is potable and of the calcium bicarbonate type. (Knapp-USGS) W74-07645

GEOHYDROLOGY AND WATER RESOURCES OF THE TUCSON BASIN, ARIZONA, Geological Survey, Washington, D.C.

E. S. Davidson.

Available from Sup Doc, GPO, Washington, D.C. 20402; Price \$6.40 paper cover (includes plates). Water-Supply Paper 1939-E, 1973. 81 p, 3 fig, 7 plate, 3 tab, 75 ref.

Descriptors: *Groundwater, *Hydrogeology, *Arizona, Aquifer characteristics, Water yield, Water levels, Water supply, Water balance, Recharge, Transmissivity. Identifiers: Tucson basin(Ariz).

The major source of water in the Tucson basin of Arizona is groundwater in storage in the aquifer underlying the basin. Groundwater is pumped for irrigation, public supply, and industrial uses and is only partially replenished by the infiltration of streamflow along the major streams and the basin perimeter. The basin is a broad northwest-trending valley bounded by mountain ranges on the eastern and western sides. The mean annual precipitation is about 12 inches on the basin surface and 25 inches or slightly more in the mountains. Because most of the precipitation is evaporated or transpired, the mean annual streamflow is only about 10,000 to 20,000 acre-feet. The major streams generally are dry during more than 300 days each year, and the flows generally last 3 days or less. Because of the erratic occurrence and quantity of flow, streamflow is not used directly as a water supply. The mean annual streamflow out of the basin is slightly more than 17,000 acre-feet. The aquifer that underlies the basin surface consists of the Pantano Formation and Tinaja beds of Tertiary age and the Fort Lowell Formation and surficial deposits of Quaternary age. These units are more than 2.000 feet thick and are composed mainly of loosely consolidated to moderately cemented silty sand to silty gravel. The chemical quality of the groundwater in most of the basin is suitable for public supply. The dissolved solids are mainly calcium, sodium, and bicarbonate. The amount of groundwater in storage to a depth of 500 feet below the 1966 water table was about 30.5 million acre-feet, and that to a depth of 1,000 feet below the water table was about 52 million acre-feet. Less than 2 million acre-feet of water was withdrawn from storage in 1940-65. Transmissivity values for the aquifer average about 50,000 gallons per day per foot and range from 1,000 to almost 500,000 gallons per day per foot. About 85,000 acre-feet of groundwater was removed from storage in 1965. (Knapp-USGS) W74-07648

GROUND-WATER LEVELS IN OBSERVATION WELLS IN KANSAS, 1966-70,

Geological Survey, Lawrence, Kans. For primary bibliographic entry see Field 7C. W74-07650

A GROUND-WATER MONITORING NET-WORK FOR KOOTENAI FLATS, NORTHERN IDAHO,

Geological Survey, Boise, Idaho. For primary bibliographic entry see Field 7A. W74-07662 HYDROLOGIC RECONNAISSANCE OF THE NORTHERN GREAT SALT LAKE DESERT AND SUMMARY HYDROLOGIC RECONNAISSANCE OF NORTHWESTERN UTAH, Geological Survey, Salt Lake City, Utah. J. C. Stephens.

Utah Department of Natural Resources Technical Publication No 42, 1974. 55 p, 5 fig, 2 plate, 12 tab, 44 ref. append.

Descriptors: *Deserts, *Groundwater, *Utah, Great Salt Lake, Brines, Saline water, Water balance, Hydrologic budget, Hydrogeology, Arid lands, Hydrologic data, Aquifers. Identifiers: *Great Salt Lake Desert(Utah).

In the northern Great Salt Lake Desert in the central part of northwestern Utah, average annual precipitation ranges from about 4.5 to slightly more than 12 inches. Runoff is scanty and reaches the desert floor only during or immediately after thunderstorms and periods of rapid snowmelt. Drainage is internal except for the part of the area immediately adjacent to Great Salt Lake. Surface outflow to Great Salt Lake is estimated to average less than 500 acre-feet annually. Three aquifers are present in much of the northern Great Salt Lake Desert. An aquifer composed of crystalline salt and jointed lakebed deposits at and just beneath the land surface averages 25 feet in thickness, underlies about 1,650 square miles of the desert floor, and yields brine. An aquifer of unknown thickness and extent is present in surficial and buried alluvial fans along the mountain flanks and yields fresh to moderately saline water. The most extensive aquifer underlies the entire area where consolidated rocks are exposed and is made up of unconsolidated to partly consolidated valley fill. This aquifer yields brine to wells completed at depths of 1,000 to 1,600 feet below land surface in the Bonneville Salt Flats area. Locally in the mountains and peripheral alluvial slopes, fresh to moderately saline groundwater is present. In northwestern Utah, groundwater is present in alluvium, valley fill, and consolidated rocks. Recharge from infiltration of precipitation is estimated to average about 100,000 acre-feet annually. Subsurface inflow supplies at least 43,000 acre-feet of recharge annually. An estimated 5.6 million acrefeet of groundwater could be recovered from storage in the upper 100 feet of saturated aquifer material in northwestern Utah. At least three-quarsaline or briny. (Knapp-USGS)
W74-07665

DEFORMATION MODULI OF WATER-BEARING FORMATIONS AT ELEVATED TEMPERATURES,

California Univ., Berkeley. Coll. of Engineering. For primary bibliographic entry see Field 4B. W74-07726

THE TRANSPORT OF RADIOISOTOPES BY FINE PARTICULATE MATTER IN AQUIFERS, Georgia Inst. of Tech., Atlanta. Environmental Resources Center. For primary bibliographic entry see Field 5B. W74-07730

SOIL MOISTURE TRANSPORT IN ARID SITE VADOSE ZONES,
Atlantic Richfield Hanford Co., Richland, Wash.

Atlantic Richfield Hanford Co., Richland, Wash For primary bibliographic entry see Field 2G. W74-07780

MICROPOROSITY IN CARBONATE ROCKS, Amoco Research Center, Tulsa, Okla. For primary bibliographic entry see Field 4B. W74-07861

PLEISTOCENE-HOLOCENE SEDIMENTS INTERPRETED BY SEISMIC REFRACTION AND

Water In Soils—Group 2G

WASH-BORE SAMPLING, PLUM ISLAND-CASTLE NECK, MASS.,

Army Coastal Engineering Research Center, Fort Belvoir, Va.

For primary bibliographic entry see Field 2L.

HYDROLOGY OF LIMESTONE KARST IN GREENBRIER COUNTY, WEST VIRGINIA, Geological Survey, Morgantown, W. Va. W. K. Jones

West Virginia Geological and Economic Survey, Morgantown, Bulletin 36, 1973. 49 p, 23 fig, 3 plate, 2 map, 5 tab, 26 ref.

Descriptors: *Karst hydrology, *West Virginia, Karst, Hydrogeology, Caves, Limestones, Water pollution, Path of pollutants, *Sinks, Springs, Aquifers. *Greenbrier County(W. Va.).

In the Fort Spring-Spring Creek karst area, Greenbrier County, W. Va., karst drainage is dominant over surface drainage. All surface runoff is diverted through sinkholes or sinking streams into subsurface flow channels in cavernous Mississippian limestones. Subsurface drainage hasins and flow directions were determined by dve-tracing techniques and by utilizing maps of un-derground conduits. The direction of subsurface flow is generally independent of the topography. Traced subsurface flow paths cross under surface ridges and often trend opposite to surface slope. The overall direction of underground flow routes is toward lower base level streams but is influenced locally by the combined effects of complex variations in geologic structure, lithology, vegetal cover, climate, former surface and subsur face flow paths, and the length of time the aquifer had undergone development. The karst water is used locally for domestic purposes, and the cave conduits and water are used for sewage and waste disposal. The dye-tracer studies showed that contaminated waste water could easily enter the karst aquifer and be transmitted through it. (Knapp-W74-07908

BURIED TRIASSIC BASIN IN THE CENTRAL SAVANNAH RIVER AREA, SOUTH CAROLINA AND GEORGIA,

Geological Survey, Aiken, S.C. I. W. Marine, and G. E. Siple. Geological Society of American Bulletin, Vol 85, p 311-320, February 1974. 12 fig, 1 tab, 13 ref.

Descriptors: *Aquifers, *South Carolina, *Georgia, *Groundwater basins, Hydrogeology, Stratigraphy, Aquifer characteristics. Identifiers: *Dumbarton Triassic basin(So. Carolical)

A basin filled with Triassic red beds, located on the South Carolina-Georgia line about 32 km southeast of Augusta, Georgia, is buried beneath about 350 m of Coastal Plain sediments. An extensive aeromagnetic survey, seismic refraction and reflection surveys, and geophysical logs and samples from three wells define the extent and character of the basin. This basin is 50 km long, 10 km wide, and trends northeast. Near the center of the Triassic basin, a well passed through 902 m of Triassic mudstone and sandstone of fluvial origin without penetrating the bottom of the basin. The permeability of the Triassic rock is extremely low, and water-transmitting fractures were not penetrated. Even slight water-level disturbances in the Triassic wells require many years to recover. Total dissolved solids of the water from the Triassic basin are about twice that in the crystalline metamorphic rocks that surround it. (Knapp-USGS) W74-07916

HYDROLOGY AND CHLORIDE CONTAMINA-TION OF THE PRINCIPAL ARTESIAN AQUIFER IN GLYNN COUNTY, GEORGIA, Geological Survey, Atlanta, Ga.

Geological Survey, Atlanta, Ga.
R. L. Wait, and D. O. Gregg.
Georgia Earth and Water Division, Atlanta, Water
Resources Survey of Georgia Hydrologic Report,
1, 1973, 93 p. 38 fig. 16 tab. 54 ref. 2 append.

Descriptors: *Hydrogeology, *Saline water intrusion, *Artesian aquifers, *Georgia, Withdrawal, Hydrologic data, Drawdown, Water yield, Aquifer testing, Potentiometric level. Identifiers: Glynn County(Ga).

The principal artesian aquifer in Glynn County, Georgia, yielded 122.3 million gallons of water per day in 1964. This limestone aquifer is at a depth of 500 feet and is about 500 feet thick. A permeable zone at the top ranges from 86 to 140 feet in thickness and a basal permeable zone at a depth of 860 feet ranges from 16 to 110 feet in thickness. Dense dolomites, from 1,000 to 1,060 feet and 1,350 to 1,385 feet, generally confine a zone of brackish water with as much chloride as 2,000 mg/liter. Pressure head increases irregularly with depth from 1.6 feet at 500 feet below the surface to over 30 feet at 1,500 feet. Transmissivity of the principal artesian aquifer is 1,500,000 gpd per foot as determined by short-term tests, and 1,600,000 gpd per foot by long-term tests. Storage coefficient is 0.0006 by short-term tests and 0.004 by long-term tests. Native groundwater in the principal artesian aquifer is of the calcium bicarbonate type, very hard, alkaline, and low in chloride. In a roughly triangular area of downtown Brunswick brackish water in the zone confined by dolomites is rising through a locally porous part of the upper dolomite and is spreading northward in both permeable zones of the principal artesian aquifer at rates up to 700 feet per year. Any increase in pumpage which would enlarge present cones of depression would accelerate this rate. (Knapp-USGS)

EXPLORATION FOR A BURIED VALLEY BY RESISTIVITY AND THERMAL PROBE SURVEYS

VEYS, Harshbarger and Associates, Tucson, Ariz. E. M. Smith. Ground Water, Vol 12, No 2, p 78-83, March-April 1974. 12 fig, 14 ref.

Descriptors: *Geophysics, *Geothermal studies, *Hydrogeology, *Alluvial channels, *Glacial aquifers, Glacial drift, *Ohio, Electrical resistance, Resistivity.
Identifiers: *Buried valleys.

Electrical resistivity and thermal probe surveys were conducted in the vicinity of Morning Sun, Ohio, to locate a buried glacial valley. The resistivity survey along six roughly parallel traverse lines was able to distinguish buried valley gravel from glacial till and Upper Ordovician limestone bedrock. Two buried valleys east of Morning Sun coalesce under Morning Sun, then continue as one valley to its junction with the Four Mile Creek buried valley at the northeast corner of Action Lake. The thermal probe survey was unable to distinguish a summer low-temperature anomaly trend, indicative of a buried valley. The depth of the buried valley under the till overburden is 90 to 150 feet which is too deep to contact the summer segment of the annual wave; therefore, a near-surface low-temperature anomaly is not produced. (Knapp-USGS)

2G. Water In Soils

IRRIGATION OF CITRUS WITH CITRUS WASTE WATER, Florida Univ., Lake Alfred. Inst. of Food and Agricultural Sciences.

For primary bibliographic entry see Field 5D. W74-07603

NITROGEN TRANSFORMATIONS IN SOIL DURING LEACHING: I. THEORETICAL CON-SIDERATIONS, California Univ., Davis. Dept. of Water Science

and Engineering.
For primary bibliographic entry see Field 5B.
W74-07619

NITROGEN TRANSFORMATION IN SOIL DUR-ING LEACHING: II. STEADY STATE NITRIFI-CATION AND NITRATE REDUCTION, California Univ., Davis. Dept. of Water Science and Engineering. For primary bibliographic entry see Field 5B. W74-07620

NITROGEN TRANSFORMATIONS IN SOIL DURING LEACHING: III. NITRATE REDUC-TION IN SOIL COLUMNS, California Univ., Davis. Dept. of Water Science and Engineering. For primary bibliographic entry see Field 5B.

For primary bibliographic entry see Field 5B. W74-07621

DISTRIBUTION OF FREE IRON AND OR-GANIC CARBON AS RELATED TO AVAILA-BLE WATER IN SOME FORESTED SANDY SOILS, Michigan Technological Univ., L'Anse. Ford

Michigan Technological Univ., L'Anse. Ford Forestry Center. S. G. Shetron.

Soil Science Society of America Proceedings, Vol 38, No 2, p 359-362, March-April 1974. 4 fig, 2 tab, 22 ref.

Descriptors: *Soil water, *Iron, *Organic matter, *Forest soils, Productivity, Moisture availability, Available water. Identifiers: *Organic carbon.

The amount of available water (0.1-15 bar tension) in the B21 horizons of six sandy soil series increased as amount of free iron and organic carbon increased. Soils of the Typic Udipsamment subgroup had the lowest, and soils of the Typic Haplorthod subgroup the highest available water retention values. Retention of available water in the C horizons of these soils was positively correlated with free iron and specific surface. Growth of hardwood and pine stands increased as amounts of free iron, organic carbon, and available water increased. (Knapp-USGS)

NITROGEN TRANSFORMATIONS DURING CONTINUOUS LEACHING, California Univ., Davis. Dept. of Soils and Plant

Nutrition. For primary bibliographic entry see Field 5B. W74-07623

BIODEGRADATION OF NITRILOTRIACETATE (NTA) IN SOILS, Michigan State Univ., East Lansing. Dept. of Crop and Soil Sciences. For primary bibliographic entry see Field 5B. W74-076-26.

A KINETIC STUDY OF AMMONIUM AND NITRITE OXIDATION IN A SOIL FIELD PLOT, California Univ., Berkeley. Dept. of Soils and Plant Nutrition.
For primary bibliographic entry see Field 5B.
W74-07625

Group 2G-Water In Soils

EFFECT OF MONOSILICIC ACID ON HYDROLYTIC REACTIONS OF ALUMINUM, Saskatchewan Univ., Saskatoon. Inst. of Pedolo-

G. M. Luciuk, and P. M. Huang. Soil Science Society of America Proceedings, Vol 38, No 2, p 235-244, March-April 1974. 7 fig, 4 tab,

Descriptors: *Hydrolysis, *Aluminum, *Weathering, *Silica, Soil chemistry, Water chemistry, Chemical precipitation, Soil formation, Nutrients, Path of pollutants.
Identifiers: *Monosilicic acid.

The hydrolytic reactions of Al ions as influenced by Si(OH)4 were studied under the experimental parameters of degree of hydrolysis of Al, Si/Al molar ratios, Al concentrations, and time. The results clearly show that the presence of Si(OH)4 affects the hydrolytic reactions of Al at all degrees of hydrolysis and thus greatly alters the nature of the reaction products as revealed by X-ray diffraction, electron-optical observations, infrared adsorption, and thermal and chemical analyses. (Knapp-USGS) W74-07626

ADSORPTION OF FENURON AND MONURON (SUBSTITUTED UREAS) BY TWO MONT-MORILLONITE CLAYS.

Louvain Univ. (Belgium). Dept. of Soil Science. For primary bibliographic entry see Field 5B. W74-07627

THE SURFACE CATALYZED HYDROLYSIS OF PARATHION ON KAOLINITE,

Agricultural Research Organizat Dagan(Israel). Inst. of Soils and Water. Research Organization, For primary bibliographic entry see Field 5B. W74-07628

FIXATION OF ZINC BY CLAY MINERALS, Georgia Agricultural Experiment Station, Athens.

M. R. Reddy, and H. F. Perkins.
Soil Science Society of America Proceedings, Vol
38, No 2, p 229-230, March-April 1974. 3 tab, 15

Descriptors: *Clay minerals, *Adsorption, *Zinc, *Clays, Bentonite, Illite, Kaolinite, Ion exchange, Soil chemistry, Ion transport. Identifiers: *Ion entrampment.

Samples of bentonite, illite, and kaolinite clays were studied for their Zn fixation properties under various pH levels, alternate wetting and drying conditions, and incubation at moisture saturation. Bentonite and illite fixed significant quantities of Zn under wetting and drying. Fixation was directly related to pH and the amount of Zn added. Incubation of treated samples at moisture saturation resulted in approximately half the amount of Zn fixed as when subjected to repeated wetting and drying. Kaolinite fixed relatively small amounts of Zn as compared to bentonite and illite regardless of treatment. X-ray and DTA did not reveal mineralogical change; therefore it is concluded that Zn was fixed as a result of precipitation, physical entrapment in clay lattice wedge zones. and strong adsorption at the exchange sites. Cation exchange capacity values were inversely related to Zn fixation. (Knapp-USGS) W74-07629

PACKING-INDUCED RADIAL PARTICLE-SIZE PACKING-INDUCED RADIAL PARTICLE-SIZE SEGREGATION: INFLUENCE ON HYDRODYNAMIC DISPERSION AND WATER TRANSFER MEASUREMENTS, Geological Survey, Menlo Park, Calif. C. D. Ripple, R. V. James, and J. Rubin. Soil Science Society of America Proceedings, Vol 38, No 2, p 219-222, March-April 1974. 3 fig, 8 ref.

Descriptors: *Sediment sorting, *Disperison, *Soil water movement, Particle size, Diffusivity, Leaching, Path of pollutants, Infiltrometers, Bulk density. Identifiers: Soil columns.

Radial particle-size segregation occurs when soil columns are prepared with the aid of vibratory compaction. This segregation is characterized by a greater proportion of coarser particles near the periphery than in the central region of the column. A specially devised, alternative repacking technique, utilizing a vibration-free impacting apparatus, reduced such segregation in soil columns to an acceptably low level. Soil columns prepared by the above two packing procedures exhibited significant differences in their water flow and salt transport properties. Miscible displacement tests could be interpreted by one-dimensional dispersion theory in the case of nonsegregated soil columns. The results from segregated soil columns could not be reconciled with this theory. Horizontal infiltration into either segregated or non-segregated soil columns produced significantly dif-ferent moisture content profiles. (Knapp-USGS) W74-07630

ANION EXCLUSION AND COUPLING EF-TRANSPORT SOILS: II. FECTS IN NONSTEADY THROUGH UNSATURATED LABORATORY AND NUMERICAL EXPERI-

Agricultural Research Organization, Bet-Dagan (Israel). Dept. of Soil Physics.

E. Bresler, and A. Laufer. Soil Science Society of America Proceedings, Vol 38, No 2, p 213-218, March-April 1974. 8 fig, 1 tab,

Descriptors: *Ion transport, *Leaching, *Soil water movement, Osmosis, Dispersion, Convection, Ion exchange, Chlorides, Mathematical models, Numerical analysis.

A numerical model for the simultaneous transport of anions and water was compared with measured chloride and water flow data. Laboratory soilcolumn experiments were conducted under conditions of infiltration, redistribution, and evapora-tion of water in the upper part of the soil profile. The effects of convection, ionic diffusion, mechanical dispersion, anion exclusion, and water flow in response to salt concentration gradients were considered jointly. The agreement between theory and experiment, as expressed by flow into and out of the soil column and by water content and salt distribution profiles, was generally good. The results were relatively insensitive to anion exclusion and osmotic effects. Estimates of dispersivity as obtained from miscible displacement experiments were sufficient for prediction. For the conditions studied, osmotic gradients and anion exclusion effects are of minor importance. (See also W74-00611) (Knapp-USGS) W74-07631

ANION ADSORPTION BY ALLOPHANIC TROPICAL SOILS: I. CHLORIDE ADSORP-

California Univ., Riverside. Dept. of Soil Science

and Agricultural Engineering.
H. Gebhardt, and N. T. Coleman.
Soil Science Society of America Proceedings, Vol. 38, No. 2, p. 255-259, March-April 1974. 1 fig., 5 tab,

Descriptors: *Adsorption, *Anions, *Soil chemistry, Laterites, Chlorides, Weathering, Leaching, Sulfates, Phosphates, Mexico, Hawaii. Identifiers: *Volcanic soils, Colombia, Tropical soils, Andepts, Allophane.

The adsorption of Cl by Andepts from Mexico, Colombia, and Hawaii was measured in solutions of HCl, HCl + NaCl, and AlCl3. Chloride adsorption varied from 0-8 meq/100 g at pH 6 to as much as 32 meq/100 g at pH 3.8. At given pH, adsorption was concentration-dependent in a manner con-sistent with the Langmuir adsorption equation. For a B-horizon sample from San Gregorio, Mexico, the Cl adsorption maxima, in meq/100 g, were 7.4 at pH 6; 10.7 at pH 4.8; 13.4 at pH 4.4; 17.3 at pH 4.2; and 31.6 at pH < 4. The average a from the Langmuir equation was 0.04 liter/meq. Adsorbed Cl was removed by leaching with water, and was exchanged by NO3. Chloride adsorption from HCl or HCl-NaCl was accompanied by the consump-tion of protons; adsorption from AlCl3 resulted in tion of protons; accorption from AIC13 resulted in the hydrolysis and precipitation of Al. Protons consumed or Al hydrolyzed exceeded Cl adsorbed by amounts corresponding closely to the effective CEC. The results suggest that protons are adsorbed to produce positively charged sites, which bind Cl nonspecifically. Chloride adsorption capacity can be conveniently measured by shaking soil with AlCl3 solution and measuring Cl uptake. Chloride capacities of soils and clay minerals, determined by the AlCl3 procedure, were, in meq/100 g, 7-30 for Dystrandepts; 16-18 for Hydrandepts; 2-4 for acid soils containing crystalline clay and oxide minerals; 4 for kaolinite; for montmorillonite and lilite. (See also W74-07635 and W74-07636) (Knapp-USGS)

ANION ADSORPTION BY ALLOPHANIC TROPICAL SOILS: II. SULFATE ADSORP-

California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering. H. Gebhardt, and N. T. Coleman.

Soil Science Society of America Proceedings, Vol 38, No 2, p 259-262, March-April 1974. 2 fig, 2 tab,

Descriptors: *Adsorption, *Anions, *Soil chemistry, Laterites, Chlorides, Weathering, Leaching, Sulfates, Phosphates. Identifiers: *Volcanic soils, Tropical soils, Andepts, Allophane.

Volcanic ash-derived soils (Andepts) from Mexfor sulfate adsorption: 10-20 meg/100 g for surface soils and 15-60 meg/100 g for subsoils. The sulfate adsorption capacity is pH-dependent. For a typical case, B-horizon material from San Gregorio, Michoacan, Mexico, capacity in meq/100 g was 13 at pH 6.3, 22 at pH 5.1, 38 at pH 4.4, and 48 at pH 4.1. Sulfate adsorption was accompanied by and dependent upon the simultaneous adsorption, or consumption, of protons. Increasing solution con-centration of sulfate beyond 5-10 meq/liter at a given pH resulted in relatively minor additional uptake by the soil. At a given pH, sulfate adsorption capacities, expressed as mmole/100 g soil, nearly equaled Cl adsorption maxima. This, together with the consumption of 1 meq H for each mmole of HCl or H2SO4 absorbed, suggests that the two anions are adsorbed on the same sites and that site protonation is a prerequisite for adsorp-tion. Sulfate adsorbed by the San Gregorio soil at tion. Sulfate adsorbed by the San Gregorio soil at pH 4 was strongly bound against hydrolysis (removal by water leaching) and was only partly displaced by 1 N KNO3. It was completely displaced by 1 N NH40Ac, pH7. Sulfate may be adsorbed by Andepts, specifically, by ligand exchange. Its affinity for soil is at least 10 times that of nonspecifically adsorbed anions such as Cl and NO3. (See also W74-07634) (Knapp-USGS) W74-07635

ADSORPTION BY ALLOPHANIC TROPICAL SOILS: III. PHOSPHATE ADSORP-

California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering. H. Gebhardt, and N. T. Coleman.

Soil Science Society of America Proceedings, Vol 38, No 2, p 263-266, March-April 1974. 2 fig. 2 tab,

Water In Soils—Group 2G

Descriptors: *Adsorption, *Anions, *Soil chemistry, Laterites, Chlorides, Weathering, Leaching, Sulfates, Phosphates.
Identifiers: *Volcanic soils, Tropical soils, An-

depts, Allophane.

Andepts from Mexico and Hawaii bound 30-70 millimoles P/100 g air-dry soil at pH 4.3-4.7 during a 1-hour reaction with 0.05M mixed H3PO4-NaH2PO4 solution. As much as 130 millimoles P/100 g were taken up from H3PO4 at pH 2.4. A B-horizon sample, San Gregorio from Michoacan, Mexico, adsorbed P from H3PO4 and consumes H in nearly equimolar amount, with 38 mil-limoles/100 g of each removed from solution in bringing soil from an initial pH of 5.4 to 4.3. Larger additions of H3PO4 dissolved appreciable Al, gave pH < 4, and yielded solutions that were supersaturated with respect to variscite. High-affinity adsorption of P from H3PO4 appeared limited by the supply of H-ions to protonate sites or react with displaced OH. Phosphate uptake from NaH2PO4 uspiaced Ori. Fnosphate uptake from Nail 2704 was accompanied by coadsorption of Na. At a given pH and level of tightly bound P established with H3PO4, addition of NaH2PO4 resulted in low-affinity adsorption of P and coadsorption of Na. Around half of the P bound from NaH2PO4 was readily cluted with water. Phosphate bound from H3PO4 was virtually insoluble in water. Some P was cluted by 0.5M arsenate or selenite. The Andepts bound P through at least three ne Andepts bound r through at least three mechanisms: high-affinity adsorption on protonated sites; low-affinity adsorption with coadsorption of Na; and formation of insoluble variscite-like substances. (See also W74-07634) (Knapp-USGS) W74-07636

RELATIONSHIPS BETWEEN THE SOIL WATER AND ENGINEERING PROPERTIES OF THE CLAYEY SOILS, (IN JAPANESE), Tokyo Univ. (Japan). Dept. of Argicultural En-

gineering.
M. Komamura, and H. Takenaka.

M. Komamura, and H. Takenaka. J Agric Sci Tokyo Nagyo Daigaku. Spec. Issue. p 151-162. 1971. Ilus. Engl summ. Identifiers: "Clayey soils, Compaction pressure, "Japan, "Soil water, Soils, "Mositure tension, "Soil physical properties, Loam, Volcanic ash

Soil water contents are shown by moisture tension (pF), and relationships are examined between soil water and engineering properties. The samples were from Kanto loam volcanic ash soil, Shinshu loam volcanic ash soil and Iwate red-yellow soil. Soil structure and water holding capacity have much effect on dry density and porosity. Kanto loam (subsoil), Shinshu loam and Iwata red-yellow soil have a blocky structure. Kanto loam (surface soil) has an aggregated structure. Optimum moisture content is evaluated about pF3 which is closely related to compaction pressure. Optimum moisture content of Kanto loam (surface soil) is a low-pF because of the interlocking of soil aggregates. In the compaction test, permeability is changed by soil moisture and minimum permeability is observed at nearly pF2. This report shows that pF is closely related to the cohesion and internal friction angle of soils. Consolidation yield point is nearly equal to the compaction pressure of a rummer.—Copyright (c) 1973, Biological Abstracts. Inc. W74-07679

AERIAL POLLUTION AND THE RAPID EVOLUTION OF COPPER TOLERANCE, Liverpool Univ. (England). Dept. of Botany. For primary bibliographic entry see Field 5B. W74-07713

THE TRANSPORT OF RADIOISOTOPES BY FINE PARTICULATE MATTER IN AQUIFERS, Georgia Inst. of Tech., Atlanta. Environmental Resources Center. For primary bibliographic entry see Field 5B.

W74-07730

SOIL MOISTURE TRANSPORT IN ARID SITE VADOSE ZONES, Atlantic Richfield Hanford Co., Richland, Wash.

R. E. Isaacson, L. E. Brownell, R. W. Nelson, and

E. L. Koetman. Available from NTIS, Springfield, Va., as Rept. No. ARH-SA-169; \$4.00 per copy, \$1.45 microfiche. Report No. ARH-SA-169 (SM-182/6), January 1974. 25 p, 6 fig, 1 tab, 28 ref.

Descriptors: Hydrology, *Soil moisture, *Measurement, *Transport depletion, *Ion transport, Movement, Transfer, Fallout, *Tritium, Hydrogen, Radioactivity, Soil water movement, Arid lands, Precipitable water, Water table, Temperature, Lysimeters, Humidity, Model studies, Research and development, Groundwater. *Washington,

Identifiers: Hanford site(Wash).

Soil moisture transport processes in the arid soils of the Atomic Energy Commission's Hanford site are being evaluated. The depth of penetration of meteoric precipitation has been determined by profiling fallout tritium at two locations where the water table is about 90 meters below ground sur-face. In situ temperatures and water potentials were measured with temperature transducers and thermocouple psychrometers at the same location to obtain thermodynamic data for identifying the factors influencing soil-moisture transport. Neutron probes are being used to monitor soil moisture changes in two lysimeters, three meters in diameter by 20 meters deep. The lysimeters are also equipped to measure pressure, temperature, and relative humidity as a function of depth and time. Theoretical models based on conservation of ume. Theoretical models based on conservation of momentum expressions are being developed to analyze nonisothermal soil moisture transport processes. Future work will be concerned with coupling the theoretical and experimental work and determining the amount of rainfall required to cause migration of soil-moisture to the water table. (Houser-ORNL) W74-07780

STRUCTURE AND FUNCTION OF HARD-WOOD LITTER AND SOIL SUBSYSTEMS AFTER CHRONIC GAMMA IRRADIATION, I. MESOFAUNA, NITROGEN, AND TOTAL SOIL RESPIRATION, Georgia Univ., Athens. Dept. of Zoology. For primary bibliographic entry see Field 5C. W74-07824

STRUCTURE AND FUNCTION OF HARD-WOOD LITTER AND SOIL SUBSYSTEMS AFTER CHRONIC GAMMA IRRADIATION. II. MICROFUNGI, South Carolina Univ., Columbia. Dept. of Biology.

For primary bibliographic entry see Field 5C. W74-07825

AXISYMMETRIC INFILTRATIONS, Oregon State Univ., Corvallis. Dept. of Agricul-

tural Engineering. R. H. Brooks, P. J. Leclercq, R. R. Tebbs, and W.

Available from the National Technical Informa-Available from the National Technical Informa-tion Service as PB-232 228, \$3.75 in paper copy, \$1.45 in microfiche. Oregon Water Resources Research Institute, Corvallis, Completion Report, WRRI-22, January 1974. 61 p, 22 fig, 1 tab, 20 ref. OWRR A-009-ORE(1).

Descriptors: *Infiltration, Soil drainage, Porous media, Hydraulic properties, Saturation, *Pore pressure, Mathematical models, *Model studies, *Soil water Sail research Soil water, Soil properties.
Identifiers: *Axisymmetric infiltration,

*Similitude requirements.

Infiltration of water into soils from a constant circular source was studied through the use of a mathematical model and a physical model. The boundary conditions were selected for the purpose of deducing the soil hydraulic properties from the infiltration process. Infiltration rate was related to the properties of the soil, to the initial condition of the soil, and to the size of the infiltration source. The similitude requirements were specified for studying infiltration using models. Some experimental data was presented to show the need for considering similitude. A general expression was presented relating capillary pressure with soil-water content during imbibition. The relationship is given in terms of the parameters obtained from a drainage capillary pressure-desaturation curve. The similitude requirements depend upon the imbibition and drainage curves. A tentative theoretical equation was presented for determining the pore size distribution of the soil from the infiltration capacity. It is suggested that small scale infiltration experiments in the field may be used to characterize the soils according to their hydraulic properties. W74-07839

SUBSURFACE EXPLORATION AND SAM-PLING OF SOILS FOR CIVIL ENGINEERING PURPOSES,

Army Engineers, Waterways Experiment Station. Vicksburg, Miss.
For primary bibliographic entry see Field 8D. W74-07905

INFLUENCE OF TEMPERATURE MOISTURE STRESS FROM SODIUM CHLORIDE SALINIZATION ON OKRA EMER-Univ., Dover. Agricultural Research Florida

Center. For primary bibliographic entry see Field 3C.

AN OSCILLATOR CIRCUIT FOR AUTOMATED

SALINITY SENSOR MEASUREMENTS, Agricultural Research Service, Riverside, Calif. Salinity Lab.

R. S. Austin, and J. D. Oster. Soil Science Society of America Proceedings, Vol 37, No 2, p 327-329, March-April, 1973. 3 fig, 1 tab, 10 ref.

Descriptors: *Salinity, *Electrical conductance, Specific conductivity, *Soil chemistry, Water chemistry, *Saline soils, Measurement.

An oscillator circuit is described that enables automatic reading of salinity sensors and other a.c. conductivity cells by measuring frequency of oscillation. The oscillator frequency varies between 0.13 to 30 KHz and changes linearly with conductance in the range of 0.03 to 10 mmho/cm. The temperature sensitivity of the frequency of the oscillator is negligible between 8 and 31 C. The calibration curves between frequency and con-ductance obtained with the oscillator circuit for both the electrical conductivity and thermistor elements of the salinity sensor are linear and readings can be obtained with lead lengths of several hun-dred meters. (Skogerboe-Colorado State) W74-08074

EFFECT OF TEMPERATURE AND PLANT WATER STRESS ON PHOTOSYNTHESIS DIF-FUSION RESISTANCE, AND LEAF WATER POTENTIAL IN SPRING WHEAT, Agricultural Research Service, Mandan, N.Dak. Northern Great Plains Research Center. For primary bibliographic entry see Field 3F. W74-08075

Group 2G-Water In Soils

EFFECT OF NARROW TRENCHING IN HARLINGEN CLAY SOIL ON PLANT GROWTH, ROOTING DEPTH, AND SALINITY, Agricultural Research Service, Weslaco, Tex. Soil and Water Conservation Research Div For primary bibliographic entry see Field 3F.

TOLERANCE OF RICE (ORYZA SATIVA L.) TO SALT DURING BOOT, FLOWERING, AND GRAIN-FILLING STAGES,

Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center. For primary bibliographic entry see Field 3C. W74-08080

NITROGEN REMOVAL RY SOIL. MECHANISMS,

Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab. For primary bibliographic entry see Field 5D.

INFILTRATION AND LANDFILL BEHAVIOR, Waterloo Univ. (Ontario). For primary bibliographic entry see Field 5B.

MODEL FOR ESTIMATING SOIL WATER, PLANT, AND ATMOSPHERIC INTERRELATIONS: I. DESCRIPTION AND SENSITIVITY,

Utah Water Research Lab., Logan. M. N. Nimah, and R. J. Hanks.

**Drainage, *Soil-water-plant relationships, *Soils water, Evapotranspiration, *Computer models, Root systems, Soil water movements, Model stu-

model and its numerical solution were developed to predict water content profiles, evapotranspiration, water flow from or to the water table, root extraction, and root water potential under transient field conditions. Soil properties needed are hydraulic conductivity and soil water potential as functions of water content. Plant properties needed are rooting depth and limiting root water potential. Climatic properties needed are potential evaporation and potential transpiration. The model predicted significant changes in root extraction, evapotranspiration, and drainage due to the variations in pressure head-water content relations and root depth. Variations in the limiting root water potential had a small influence on estimated evapotranspiration, drainage, and root extraction. (See also W74-08085) (Skogerboe-Colorado State) W74-08084

MODEL FOR ESTIMATING SOIL WATER, PLANT, AND ATMOSPHERIC INTERRELATIONS: II. FIELD TEST OF MODEL, Utah Water Research Lab., Logan. M. N. Nimah, and R. J. Hanks.

Descriptors: *Drainage, *Soil-water-plant relationships, *Soil water, Evapotranspiration, *Computer models, Root systems, Soil water movement, Model studies.

A mathematical model was developed to predict flow from or to the water table, root extraction, vater content profiles, evapotranspiration, water root water potential at the surface under transient conditions. The model was field tested in 1970 and 1971. With alfalfa as the crop, predicted and computed water content-depth profiles show best agreement 48 hours after any water addition. The poorest agreement for all crops tested was right after irrigation. The computed cumulative upward water flow from the water table was 4.80 cm as compared to 0.0 cm measured for the whole 1971 season of 116 days. (See also W74-08084) (Skogerboe-Colorado State) W74-08085

EFFECTS OF DRAINAGE AND ORGANIC AMENDMENTS ON THE RECLAMATION OF A SODIC SOIL CROPPED WITH RICE,

California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering. For primary bibliographic entry see Field 3C. W74-08087

QUALITY OF DRAINAGE WATER FROM A HEAVY-TEXTURED SOIL, Ohio State Univ., Columbus. Dept. of Agricultural

Engineering. For primary bibliographic entry see Field 5B.

EFFECT OF HUMIDITY AND TEMPERATURE

ON MICROBIAL ACTIVITY IN MOOR PEAT SOILS, (IN RUSSIAN), T. G. Zimenko, and L. S. Revinskaya. Mikrobiologiya. Vol 41, No 5, p 891-895, 1972. Illus. (English summary).

Identifiers: Actinomycetes, Bacteria, *Microbial activity, Microorganisms, Moor, *Peat soils, Minerals, Organic compounds, Ammonia, *Soil humidity, *Soil temperature.

Mineralization of organic compounds in moor peat soils depended on humidity and temperature. Ammonification was sufficiently active when the soil humidity was 10-80% of the pore volume. The maximal energy of nitrification was found when the soil humidity was 40% of the pore volume; nitrification was inhibited at the humidity of 10-20% and almost absent at 80%. The microbiological processes in moor peat soils were most intensive at 35 deg. The decrease of temperature down to 15 deg. inhibited the activity of ammonifying and nitrifying bacteria, microorganisms assimilating mineral nitrogen, actinomycetes and sporeforming bacteria. The activity of cellulose-decomposing, oligonitrophilous and other microorgan-isms also decreased. The intensive microbial activity in moor peat soils with the humidity of 40% of the pore volume resulted in a higher loss of total organic substances, nitrogen and carbon than at other values of the humidity.--Copyright (c) 1973, Biological Abstracts, Inc.

FLOOD AND SEEPAGE WATER SAMPLING TECHNIQUES IN RICE FIELDS UNDER DIFFERENT WATER MANAGEMENT PRAC-TICES.

California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 5B. W74-08090

LEACHATE TREATMENT BY COAGULATION AND PRECIPITATION,

Camp, Dresser, and McKee, Boston, Mass For primary bibliographic entry see Field 5D.

IONIC ACTIVITY COEFFICIENTS IN WATER SOLUTIONS CALCULATED BY MEANS OF NOMOGRAPHS,

For primary bibliographic entry see Field 2K.

RELATIONSHIP BETWEEN SOIL OXYGEN DIFFUSION RATE AND YIELD OF OATS IN A COASTAL ALLUVIAL SOIL AT CRITICAL SALINITY LEVEL,

Department of Agriculture, Frederiction (New Brunswick). Research Station. For primary bibliographic entry see Field 3C. W74-08094

EFFECT OF WATER-SOLUBLE DECOMPOSI-TION PRODUCTS OF HERBACEOUS PLANTS ON UPTAKE OF RADIOISOTOPES IN SOIL. (IN

RUSSIAN), Akademiya Nauk SSSR, Sverdlovsk. Inst. of Plant

and Animal Ecology.
M. Ya. Chebotina, and N. V. Kulikov.
Ekologiya. Vol 4, No 1, p 102-103, 1973.

Cerium, Cesium, *Decomposition(Herbaceous plants), *Soils, Strontium, Yttrium, *Absorption, *Radioisotopes. *Soils,

Water-soluble products of the decomposing aboveground mass of herbaceous plants reduce the uptake of radioisotopes in soil, thereby increasing their content in the liquid phase. The extracts had the strongest effect on the mobility of Co60 and Sr90 in the soil-solution system. The distribution coefficients of these radioisotopes in the presence of the extracts decreased on the average by more than an order of magnitude, whereas the distribution coefficients of Y91, Cs137 and Ce144 decreased on the average by a factor of 2-4.--Copyright 1973, Biological Abstracts, Inc. W74-08117

CORRELATIONS BETWEEN P, FE AND MN AVAILABILITY IN WATER-LOGGED SOIL AT DIFFERENT FERTILITY LEVELS, Uttar Pradesh Inst. of Agricultural Sciences, Kan-

pur (India). Div. of Soils and Agricultural Chemistry.

A. N. Pathak, Shri Krishna, and K. N. Tiwari. J Indian Soc Soil Sci. Vol 20, No 4, p 385-389. 1972

Identifiers: Iron, *Manganese, *Phosphorus, Rice, *Soils(Waterlogged), *Fertilizers.

Correlations between P, Fe and Mn availability in waterlogged soils at different levels of fertility were studied. The available P, Mn++ and Fe++ content of soil increased up to the 70th day after transplanting (of rice plants) and decreased thereafter until the 90th day. Application of fertilizers increased the amount of available soil P as well as Mn. The availability of Fe, however, decreased with increasing fertility levels. Significant positive correlations were recorded between between P and Fe and also between Mn and Fe.--Copyright 1973, Biological Abstracts, Inc. W74-08134 available soil P and Mn and negative values

EFFECT OF DILUTE SALT SOLUTIONS ON CHERNOZEM SOIL ESTIMATED THROUGH THE HYDRATION PROPERTIES OF THE COL-LOIDS, Indian Inst. of Tech., Kharagpur. Dept. of Agricul-

tural Engineering.
B. Datta, and I. Szabolcs.

J Indian Chem Soc. Vol 49, No 11, p 1131-1136.

1972.
Identifiers: *Chernozem soils, Colloids, Dif-ferential thermal analysis, Hydration, *Illite, Moisture, *Montmorillonite, *Salt solutions, Soils, X-ray analysis, Sodium.

Samples of chernozem soil (containing initially illite and montmorillonite) enriched with 3 levels of pure illite and bentonite were leached for a number of times in columns with single salt solution of Na2CO3, NaCl and MgCl2, and their clay fractions were studied by differential thermal and Xray methods. Illite treated samples adsorbed less moisture at maximum hygroscopicity than montmorillonite treated ones, and the energy needed to drive off the moisture from the illite treated samples, as indicated by differential thermal analysis, was relatively higher than for montmorillonite samples. The location and force of Na bonding on the surfaces of illite and montmorillonite indicated that Na ions had a tendency towards less hydration on illite than on montmorillonite.--Copyright 1973, Biological Abstracts, Inc. W74-08135 CALCULATION OF CAPILLARY RISE FROM GROUNDWATER TABLE INTO THE ROOT ZONE UNDER STEADY-STATE CONDITIONS, (IN GERMAN).

Niedersaechsisches Landesmat Niedersaechsisches Landesmat Tuer Bodenforschung, Hannover (West Germany). W. Giesel, M. Renger, and O. Strebel. Z. Pflanzenernachr Bodenkd. Vol 132, No 1, p 17-30, 1972, Illus. English summary.

30, 1972, Ilius. English summary. Identifiers: *Capillary action, Flow, *Germany(Lower Saxony), Ground water table, *Hydraulic conductivity, *Soil moisture suction, Steady-state(Conditions), Velocity, Root zone, Soil profiles, Darcy's Law.

The capillary rise from groundwater table to the bottom of the effective root zone under steadystate conditions was calculated numerically for 20 state conditions was calculated underleanly for 20 idealized single-layer and multi-layer soil profiles commonly found in large areas of Lower Saxony, Germany. The calculations are based on Darcy's law, using the relations between soil moisture suction and hydraulic conductivity experimentally determined on soil cores. Both the height of capillary rise and the capillary flow rate very strongly depend on soil texture and on soil structure. Among the single-layer soil profiles the height of capillary rise at the same flow rates is greatest in clay silt (loess) and loamy sand, and lowest in gravelly sand and silty clay. On 2-layer soil profiles besides texture and structure of the layers the depth of groundwater table below the layerboundary is also of great importance on height and flow rate of capillary rise.--Copyright 1973, Biological Abstracts, Inc.

2H. Lakes

SEASONAL CHANGES IN WATER QUALITY AND PRIMARY PRODUCTIVITY IN DOE VAL-

LEY LAKE, Kentucky Univ., Lexington. Water Resources For primary bibliographic entry see Field 5C. W74-07605

WORLD'S GREATEST SOURCE OF FRESH

Geological Survey, Albany, N.Y. Water Resources Div.

R. M. Waller.

Journal of the American Water Works Association, Vol 66, No 4, p 245-247, April 1974. 2 fig.

Descriptors: *Great lakes, *Great lakes region, *Water resources, Groundwater, Lakes, Water supply, Hydrologic cycle, Water reuse, Water resources development.

The Great Lakes are the largest system of freshwater lakes in the world. As such, they offer op-portunities for virtually unlimited supplies of portunities for virtually unlimited supplies of freshwater to their region, provided the water is properly treated for reuse. The abundance of the basin's water resources is not the result of exceptionally high precipitation, which averages only 31 in. annually. Runoff is not exceptional either, with a general range of 30-40 per cent of the precipitation. The large storage capacity of the lakes and, to a lesser extent, the storage capacity of the lakes and, of a lesser extent, the storage capacity of the glacial deposits and underlying bedrock cause retention and slow release of runoff and modify extremes of outflow from the lake system. The average annual discharge of the St. Lawrence River is 239,000 cfs, or 154,000 mgd. The range in discharge is extremely small in comparison with that of other major streams. (Knapp-USGS) W74-07643

INVESTIGATION OF THE SEDIMENTS AND POTENTIAL MANGANESE NODULE RESOURCES OF GREEN BAY, WISCONSIN, Wisconsin Univ., Madison. Geo-Environmental and Mineral Resources Program.

For primary bibliographic entry see Field 2J.

SEDIMENT DISTRIBUTION IN A BEACH RIDGE COMPLEX AND ITS APPLICATION TO ARTIFICIAL BEACH REPLENISHMENT, Geological Survey, Urbana, Ill. For primary bibliographic entry see Field 2J.

ENVIRONMENTAL CONTROL OF NITROGEN FIXATION IN LAKES, I. IN SITU NITROGEN FIXATION BY FREE LIVING BULE-GREEN ALGAE, AND II. NITROGEN FIXATION BY THE DUCKWEED-ALGAL ASSOCIATION, Michigan State Univ., East Lansing. Dept. of Crop

and Soil Sciences.
For primary bibliographic entry see Field 5C. W74-07716

AN INVESTIGATION OF THE WATER QUALI-TY AND PRODUCTIVITY OF POLSON BAY, FLATHEAD LAKE, MONTANA, Montana Univ., Missoula. Dept. of Zoology. For primary bibliographic entry see Field 5C. W74-07717

TESTACEA (PROTOZOA: SARCODINA) AS IN-DICATOR OF WATER QUALITY
WESTERN MONTANA,
Montana Univ., Missoula. Dept. of Zoology.
For primary bibliographic entry see Field 5A.
W74-07718

CHARACTERIZATION OF SUSPENDED SEDI-MENTS IN WATER FROM SELECTED WATERSHEDS AS RELATED TO CONTROL PROCESSES, NUTRIENT CONTENTS, AND LAKE EUTROPHICATION, Washington State Univ., Pullman. Dept. of Agronomy and Soils. CHARACTERIZATION OF SUSPENDED SEDI-

For primary bibliographic entry see Field 5B. W74-07736

SEASONAL AND SPATIAL CHANGES IN PRIMARY PRODUCTION AND NUTRIENTS IN LAKE MICHIGAN, Wisconsin Univ., Milwaukee. Center for Great

Lakes Studies. For primary bibliographic entry see Field 5C. W74-07773

HYDROLOGIC MODELS OF THE GREAT

LAKES, State Univ. of New York, Buffalo. Dept. of Civil Engineering. D. D. Meredith.

Available from the National Technical Information Service as PB-232 163, \$3.25 in paper copy, \$1.45 in microfiche. Illinois Water Resources 31.49 In Information Information Age (14.5) Information (14.5) Informa

*Great Descriptors: *Precipitation(Atmospheric), Evaporation, Runoff, Hydrology, *Model studies, *Statistical methods, *Water balance, Regression analysis. Identifiers: Statistical analysis

It is demonstrated that net basin supply values (equivalent to precipitation on the lake minus the evaporation from the lake plus the runoff into the lake) obtained from water balance studies without accounting for the thermal expansion and concentration of water may be in error by as much as 100 percent during some months for each lake. The individual hydrologic components are assumed to be normally distributed for each month and linear regression equations are estimated for predicting value of the individual monthly hydrologic

components. It is shown that some of the hydrologic components for down wind (in this nyurologic components for down wind (in this case downstream) lake are dependent upon hydrologic events for the upwind lakes. This is particularly so for precipitation in the down wind lake basins which appears to be highly dependent upon evaporation values for up wind lakes. W74-07826

FACTORS CONTROLLING THE DYNAMICS OF NON-IONIC SYNTHETIC ORGANIC CHEMICALS IN AQUATIC ENVIRONMENTS, Purdue Univ., Lafquette, Indiana, Dept. of Forestry and Conservation. For primary bibliographic entry see Field 5B. W74-07831

THE FATE AND EFFECTS OF PESTICIDES IN THE AQUATIC ENVIRONMENT OF FLATHEAD LAKE DRAINAGE AREA, Montana Univ., Missoula. Dept. of Zoology. For primary bibliographic entry see Field 5C.

DETERMINING A RECREATIONAL LAKE'S TOLERANCE FOR DEVELOPMENT AND Research Center. For primary bibliographic entry see Field 5A. W74-07836 New Hampshire Univ. Durham. Water Resources.

SURVIVAL OF ENTERIC PATHOGENS AND INDICATOR ORGANISMS IN NATURAL WATERS, Tennessee Univ., Knoxville. Dept. of Civil Engineering.

For primary bibliographic entry see Field 5A.

BIG EDDIES AND MIXING PROCESSES IN THE GREAT LAKES, Waterloo Univ. (Ontario).
For primary bibliographic entry see Field 5B.

REGIONAL ENERGY-WATER PROBLEMS, OHIO-GREAT LAKES. Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 6D. W74-07973

THE BIOLOGY AND ECOLOGY OF RIVER CARPSUCKER, CARPIODES CARPIO (RAFINESQUE), IN THE LITTLE MISSOURI ARM OF LAKE SAKAKAWEA, NORTH DAKOTA,

North Dakota Univ. Grand Forks D. J. Trzpuc.

Available from the National Technical Informa-tion Service as COM-73-11531. MS thesis, December 1972. 49 p. 3 fig, 13 tab, 47 ref.

Descriptors: *Carpsucker, *North Dakota, *Distribution, *Life history studies, Turbidity, Water temperature, Animal growth, Spawning, Reproduction, Age, Fish diets, Sexual maturity, Fecundity, Water levels. Identifiers: *Carpiodes carpio, Little Missouri Arm(N.D.), Lake Sakakawea(N.D.).

The life history, growth, and ecologic distribution of river carpsucker were studied in the Little Missouri Arm of Lake Sakakawea, North Dakota, between May 15 and August 14, 1970. The dis-tribution of the carpsucker seemed to be governed by water level, temperature, and turbidity. Dissolved oxygen concentration, which was near saturation, throughout the study, did not seem to affect their distribution. Hydrogen ion concentra-

Group 2H-Lakes

tion was optimal for fish throughout the study. The size of carpsuckers taken at the nine stations was found to vary considerably; those taken at four stations in the eastern segment of the arm had mean lengths and mean weights greater than the average of the total catch. This growth rate may be a result of the high concentrations of zooplankton, especially Daphnia, which were taken at these stations. The larger sized carpsuckers at these stations may also indicate that adults prefer a less turbid habitat. Limited observations of reproduction and spawning habits were made, and the evidence indicated that carpsuckers spawn in the Little Missouri River upstream from the area studied. (Iones-Wisconsin) W74-07991

PHYTOPLANKTON COMMUNITY STRUCTURE AND NUTRIENT RELATIONSHIPS IN LAKE CARL BLACKWELL, OKLAHOMA,

Oklahoma State Univ., Stillwater. A. R. Faust.

Available from the National Technical Informa-tion Service as ORD-4254-13, \$5.00 in paper copy, \$1.45 in microfiche. PhD thesis, July 1973. 59 p. 12

Descriptors: *Algae, *Phytoplankton, *Biological communities, *Nutrients, *Aeration, Oklahoma, Light penetration, Dissolved oxygen, Water temperature, Nitrates, Phosphorus, Carbon, Organic matter, Limiting factors, Reservoirs, Chlorella, Taste, Hydrogen ion concentration, Carbon dioxide, Cyanophyta, Diatoms, Odor, Eutrophication, Montmorillonite, Turbidity, Sediments, Fish, Zooplankton, Insects. Identifiers: *Lake Carl Blackwell(Okla.), Species

Phosphorus, nitrogen, carbon, and other physiochemical parameters were studied to provide basic data on limiting factors of planktonic algae which impart malflavors. Number-based diversity of phytoplankton enclosed in enriched, isolated columns was compared to diversity in Lake Carl Blackwell, Oklahoma. Taste and odor in Lake Carl Blackwell, Oklanoma. I aste and odor in the water supply were related to algal blooms. Spe-cies diversity of phytoplankton as indicators of eutrophic conditions was reviewed. Data are presented to support the theory that no single limiting nutrient hypothesis is applicable to Lake Carl Blackwell. Blue-greens probably contribute more than diatoms or greens to taste and odor in late summer. Taste and odor in spring months prior to June algal blooms may be due to bacterial decomposition of allchthonous organic material washed in by rains. Aeration did not affect algal numbers but slightly reduced surface temperature and water clarity and increased oxygen content of the bottom water. Release of sedimentary phosphorus and addition of orthophosphate produced significant increases in algal numbers in two days for a juvenile community and in four days for a senile community. Blue-greens responded less than greens to added phosphorus. Diatoms did not respond. (Jones-Wisconsin) W74-07992

ANADROMOUS FISHES OF LAKE PONCHAR-TRAIN AND ITS TRIBUTARIES, Louisiana Wild Life and Electric

New Orleans.

J. T. Davis, and B. J. Fontenot.

Available from the National Technical Informa-Available from the National Technical Informa-tion Service as COM-72-11047, \$3.00 in paper copy, \$1.45 in microfiche. National Marine Fishe-ries Service, Arlington, Va., Report No. NOAA-72070612, May 1969. 96 p. 1 fig, 42 tab, 7 ref. 7301000. PL 89-304.

Descriptors: *Striped bass, *Fish populations, Louisiana, Anadromous fish, Shellfish, Syste-Louisiana, Anadromous fish, Shellfish, Syste-matics, Salinity, Brackish water, Fish establish-ment, Sampling, Freshwater, Water quality, Estuarine fisheries, Fish food organisms. Identifiers: *Lake Ponchartrain(La.), Atlantic sturgeon, Alabama shad, Lake St. Catherine(La.), Lake Borgne(La.), Lake Maurepas(La.).

The extent and significance of anadromous fishes in Louisiana were evaluated by trawl and trammel net sampling in Lakes Pontchartrain, Borgne, Maurepas, and St. Catherine and hoop-net and electro-fishing sampling was conducted of their tributary streams. The species caught are listed. Water quality data was compiled to extract per-tinent or limiting factors. The striped bass popula-tion formerly present in fishable numbers in the coastal areas of eastern Louisiana in now extinct. There is a reproducing Atlantic sturgeon population in the coastal streams that is supporting a very minor commercial fishery. No sport fishing has been observed. Alabama shad were recorded both as juveniles and adults which indicates that at least a reproducing population is present although in insufficient numbers to comprise a fishery. In-asmuch as the water quality in the study area has improved during the past ten years and there is a plentiful supply of forage organisms to support an introduced striped bass population, attempts should continue to introduce this species. No evidence was discovered to indicate the presence of direct competition from other species. (Jones-Wisconsin)

THE FRESHWATER MOLLUSKS FROM THE DUNE AREA NORTH OF THE HAGUE,

W. J. Kuijper. Rasteria. Vol 37, No 1/2, p 1-20. 1973. Illus.

Basteria. Vol. 37, 100 112, p. 100 112, p.

The mollusks found in the dune lakes and pools in the catchment area of the waterworks of the Hague, Netherlands, were surveyed during 1966-1970. These lakes and pools were formed by infiltration of Rhine water from 1955. Before that time the area was dry with the exception of 3 localities. The hydrology of the infiltrated water is described, as well as general aspects of flora and fauna of the newly formed waters. Two types of water are distinguished here: lakes which receive water are distinguished here: lakes which receive river water by means of a pipeline and pools caused by rising of the ground water table. Drought periods caused by interruption of the in-filtration greatly influence the local distribution of the mollusks. The shallow pools may dry out easily and completely. Deep, permanent pools harbor comparatively more species than shallow ones. The mollusks probably populated the new lakes and pools in the dunes by means of transport of birds, among which ducks are common, and aquatic insects. All species found are common in the Netheland Account of the Common in the Netheland Ac the Netherlands, except for Gyraulis laevis. In the future more species will probably migrate to this by now well watered dune area.—Copyright 1973, Biological Abstracts, Inc.

A PREDICTION OF CHANGES IN THE THER-MAL CYCLE OF A STRATEGIC MAL CYCLE OF A STRATIFIED LAKE USED TO COOL A 1000 MW POWER PLANT, Cornell Univ., Ithaca, N.Y. Dept. of Thermal Engineering.
For primary bibliographic entry see Field 5C.

ECOLOGY OF THE EULITTORAL ZONE OF

Warsaw Univ. (Poland). Lab. of Hydrobiology. For primary bibliographic entry see Field 5C. W74-08003

PLANKTON PRODUCTION AND WATER QUALITY IN SPANISH RESERVOIRS. FIRST REPORT ON A RESEARCH PROJECT, Centro de Estudios Hidrograficos, Madrid (Spain).

For primary bibliographic entry see Field 5C. W74-08005

OXYGEN DEPLETION MODEL FOR CAYUGA

California Univ., Berkeley. Dept. of Civil and Environmental Engineering. For primary bibliographic entry see Field 5C.

PRESENT AND FUTURE OF LAKE SEVAN (SOVREMENNOYE SOSTOYANIYE I BUDUSHCHEYE OZERA SEVAN),

G. G. Vardumyan. Meteorologiya i Gidrologiya, No 10, p 94-103, October 1973. 1 fig. 3 tab, 5 ref.

Descriptors: Lakes, *Lake morphology, *Lake morphometry, *Diversion, *Alteration of flow, Diversion tunnels, Reservoirs, Pumping plants, Hydroelectric plants, Irrigation canals, Thermal properties, Water temperature, Dissolved oxygen, Water balance, Runoff, Water storage, Hydrobiology, Maps, Forecasting, Investment. Identifiers: *USSR(Lake Sevan-Armenia).

Lake Sevan basin in northern Armenia is a huge tectonic depression having the shape of a triangle bounded by the Gegamskiy, Vardenis, Areguni, and Sevan mountain ridges. The height of ridges above the lake varies between 500 and 1,800 m. The lake is a large high-mountain body of water. The area of the lake drainage basin, including the water surface area, is 4,890 sq. m. Between 1930 and 1971, the level of the lake declined by 18 m. The volume of water in the lake dropped from 58.5 billion cu m to 35.0 billion cu m. The water surface area was reduced from 1,420 sq km to 1,254 sq km. The lake level declined from 1,916 m and as of January 1, 1972 was 1,898.02 m. Measures to divert flow to Lake Sevan include: (1) annual transfer of 250 million cu m of runoff from the transfer of 20 million cu m of runoff from the Arpa River beginning in 1976; (2) annual transfer of 50 million cu m of runoff from the Vorotan River beginning in 1981 and later, if necessary, transfer of 100-150 million cu m of runoff per year; (3) annual transfer of 40 million cu m of runoff from the Getik River (right tributary of the Agstev River) beginning in 1981; and (4) annual transfer of 100 million cu m of runoff from the Azat and Vedi Rivers beginning in 1991. Provisions have been made to divert a total of 440 million cu m of water to the lake annually. Upon completion of all mea-sures the lake level can conceivably be raised by 5 m by the year 2000. Data are presented on use of long-term water storage of the lake for hydroelectric power and irrigation and on the state of the tric power and irrigation and on the state of the lake's physicochemical and biological regimes in connection with lowering of the lake level. Annual water balances of the lake for 1927-71 and a forecast of the lake's water balances for different periods between 1972 and the year 2000 are tabulated. (Josefson-USGS) W74-08048

APPLICATION OF SATELLITE DATA FOR HYDROLOGIC PURPOSES (ISPOL'ZOVANIYE SPUTNIKOVOY INFORMATSII DLYA GIDROLOGICHESKIKH TSELEY), Gosudarstvennyi Gidrologicheski Institut, Lenin-

grad (USSR).
For primary bibliographic entry see Field 7B.
W74-08049

ZONATION OF MOSSES ON THE BANKS OF THE NOVY CEPSKY POND. (IN CZECH.), **Jihoceske** Muzeum Ceske Budejovice

(Czechoslovakia).

(Czechoslovakia).
M. Rivola, and M. Vondracek.
Preslia (Prague). Vol 44, No 4, p 359-363, 1972.
Identifiers: Bolboschoenus-maritmus, Identifiers: Bolboschoenus-maritmus, *Czechoslovakia(Novy Cepsky pond), Forests, Glyceria, Mineral, *Mosses, Phragmites-commu-nis, Pine, Ponds, Sedges, Sphagnum-fallax, Sub-strates, Typha-angustifolia. *Vegetation zones.

A total of 6 vegetation zones were differentiated on the banks of the Novy Cepsky pond (near Cep, Trebon district, Bohemia, Czechoslovakia) in the summer of 1971: pine forest on mineral substrate similar to associations of the alliance Pino-Ouercion, pine forest on peat (originally probably belonging to the alliance Rhynchosporion albae, now forming a transition to the alliance Pino-Ledion), a muddy phase of the pond with Sphagnum fallax and other loosely distributed species, sedge stands with isolated areas of Phragmites communis, stands of Bolboschoenus maritimus and Glyceria maxima with island-like occurrence of Typha angustifolia, the bare pond bottom with typical associations. Occurrence and distribution of 24 moss species in the individual zones are presented.--Copyright 1973, Biological Abstracts, Inc. W74-08119

RELICS OF THE BOGGY VEGETATION IN SODIC TERRITORIES, (IN HUNGARIAN), Lajos Kossuth Univ., Debrecen (Hungary). Dept. of Botany.

M. Balogh Acta Biol Debrecina. 9, p 111-112, 1971. Hentifiers: *Boggy areas(Dystrophic), Floristics, *Hungary(Velence Lake), Organic matter, Peat, Relics, *Sodic steppe areas, Vegetation, Relics.

The dystrophic bogs of the Velence Lake in Hungary are now assumed not to have been formed in alkaline water, but to form relics preserved through the accumulation of masses of acidic peat and other organic substances with high adsorption capacity. The new hypothesis is fortified by wellknown erosion phenomena, by floristic observations by Kerner in the 19th century and by data on a recently discovered bog relic in a sodic steppe in Hungary.--Copyright 1973, Biological Abstracts, Inc. W74-08122

GROWTH OF THE CASPIAN ROACH IN THE MINGECHAUR RESERVOIR, (IN

BAIJARIAN), S. E. Memmedova, and Sh. R. Ibragimov Uch Zap Azerb Univ Ser Biol Nauk. 1, p 43-47.

Identifiers: *Caspian roach, Condition factors, *Growth, Length, Reservoirs, Rivers, *Roach, Rutilus-Rutilus-Caspicus, *USSR(Kura River),

The Caspian roach (Rutilus rutilus caspicus) in the Mingechaur reservoir on the Kura river (USSR) is distinguished by a rapid increase in length and gain in weight and high condition factor. The average length of the females is 23.3 cm and of males 22 cm. The condition factor according to Fulton is 2.32 for females and 2.08 for males.—Copyright 1973, Biological Abstracts, Inc. W74-08123

INVESTIGATIONS ON THE OCCURRENCE AND DECOMPOSITION OF FATS AND FATTY ACIDS IN LAKES, (IN GERMAN),
Biochemisches Institut Umweltcarciogene,
Ahrensburg (West Germany). For primary bibliographic entry see Field 5C. W74-08141

2I. Water In Plants

STUDY ON THE PERIPHYTIC COLONIZA-TIONS OF A LATERAL ENVIRONMENT OF THE RIVER PO(ITALY), (IN ITALIAN), Milan Univ. (Italy). Laboratorio di Zoologia. Paola Chierici Magnetti, Milvia Dotti, Andreina Paoletti Di Chiara, Elio Smedile, and Ettore

Atti Accad Naz Lincei Rend Cl Sci Fis Mat Nat Sez III. Vol 51, No 5, p 414-421, 1971. Illus.

Identifiers: Colonizations, Environment, *Italy(River Po), Marsh, *Periphytic populations, Rivers, Seasonal, Vegetation, *Aquatic animals.

The composition of periphytic populations by the immersion of natural substrata (stones) in a stretch of low river marsh land was studied. The results obtained with seasonal experiments are reported. Colonization of the substrata is vast during the entire year and, in terms of biomass, is larger in autumn for vegetation, and in winter for animals.--Copyright 1973, Biological Abstracts, Inc. W74-07702

LEAD DETECTION IN LIVING PLANT TISSUE USING A NEW HISTOCHEMICAL METHOD, California Univ., Los Angeles. School of Engineering and Applied Science. For primary bibliographic entry see Field 5A. W74-07711

STUDIES ON SOUTHEASTERN AQUATIC IN-SECTS.

Georgia Univ., Athens. Dept. of Entomology. For primary bibliographic entry see Field 5C. W74-07740

AN ECOLOGICAL STUDY OF THE MISSOURI RIVER PRIOR TO CHANNELIZATION, Univ., South Dakota Vermillion. Dept. of Biology.

I C Schmulbach Available NTIS as PB-232 150, microfiche \$1.45. South Dakota Water Resources Institute, Brookings, Completion Report, March 1974, 34 p. OWRR B-024-SDAK(1)14-31-0001-3333.

Descriptors: *Missouri River, Aquatic environ-ment, *Benthos, Aquatic drift, Zooplankton, Fish, Food habits, *Fish populations, *Periphyton, *South Dakota, Ecology, Production, Caddisflies, Marshes, Fish diets, *Biota. Identifiers: *Sturgeon(Shovelnose).

Aquatic biota in the unchannelized Missouri River (South Dakota) was studied prior to construction of bank-stabilizing structures. Cattail-dominated marsh habitat adjacent to the main channel was important to the production of benthos, aufwuchs, drift, fishes and, to a lesser extent, zooplankton. The importance of this habitat to the integrity and stability of the biota of this large botic ecosystem was emphasized. Colonization rates and taxonomic diversity on artificial samplers by aufwuchs macroinvertebrates were faster and larger and the standing crop was 71% greater in the unchannelized river than in the bank-stabilized river. The drift was dominated by aufwuch taxa, principally caddisflies (Hydropsyche spp.); many originated from substrates in chutes which course the marshes. Fishes from 35 species utilized marsh habitat; primarily as a nursery while immature. Fish standing crop and annual production values (dry wt.) conservatively were estimated as 48.2 kg/ha and 121 kg/ha, respectively. An unexplained movement of all fishes from the marshes was observed in late summer. Shovelnose sturgeon populations were high (2500/linear km) in the spring fall. Extensive seasonal movement and very slow growth was characteristic of this species. Sturgeon subsisted on a minimal ration except in the early winter when benthic and aufwuchs macroinvertebrates became accessible in the main stream as a result of mancontrolled water level changes. (Wiersma-South Dakota)

DOCUMENTATION OF PROSPER - A MODEL OF ATMOSPHERE-SOIL-PLANT FLOW, Oak Ridge National Lab., Tenn. WATER

For primary bibliographic entry see Field 2A. W74-07785

MODELS OF MATTER FLOW IN A SOUTHERN MIXED HARDWOOD FOREST IN FLORIDA:

PRELIMINARY RESULTS,
Florida Univ., Gainesville. Dept. of Botany.
For primary bibliographic entry see Field 5B.

EFFECTS OF IONIZING RADIATION ON PROCESSES INFLUENCING TOLERANCE OF TREE SEEDLINGS, Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 5C. W74-07815

THE EFFECTS OF RIVER FLUCTUATIONS RESULTING FROM HYDROELECTRIC PEAK ING ON SELECTED AQUATIC INVERTEBRATES,

TEBRATES, Idaho Univ., Moscow. Coll. of Forestry, Wildlife and Range Sciences.
C. MacPhee, and M. A. Brusven.
Available from the National Technical Information Service as PB-232 268, \$3.25 in paper copy, S1.45 in microfiche. Idaho Water Resources Research Institute, Moscow, Completion Report, January 1974. 21 p, 2 fig, 3 tab, 3 ref. OWRR A-035-IDA(2). 14-01-0001-3512.

Descriptors: *Aquatic insects, *Littoral drift, Intertidal areas, Diel migration, *Idaho, *Invertebrates, Hydroelectric power, *River flow, *Invertebrates, Hydroeteeure post-Caddisflies, Stoneflies, Mayflies. Identifiers: Dworshak Dam(Ida), Clearwater River(Ida), Dicosm californica, Nymphs.

Near-shore variation in number and weight of riffle insects was shown to be affected by changes in depth (15, 30 and 45 cm) and current velocity, interacting with data and station of sampling. This differential littoral distribution of riffle insects resulted in variation of the littoral community structure. In the non-fluctuating system, commu nity diversity and diversity per individual decreased with increasing depths of 45 cm and current velocity to 1.1 m/sec. Fluctuating flows appear to reverse the order of the community structure, i.e., community diversity and diversity per individual increase with increasing depth to 45 cm and current velocity to 1.1 m/sec. A flow reduction exponentially increased the number of drifting insects in zones adjacent to the exposed substrate in the shoreline. Insects tested in the laboratory demonstrated variability in temperature-exposure variability in temperature-exposure tolerances. The case-bearing caddisfly, Dicosmoecus sp., was generally more tolerant than the stonefly, Pteronarcys californica, at most temperature regimes. Older age-class nymphs of the latter were more tolerant than younger nymphs. Shore migration studies indicated stoneflies were much more successful in maintaining contact with the water column during flow reductions than caddisflies and mayflies; mayflies were most vulnerable. W74-07830

TRICHOPTERA IN THE RESERVATION AREA HEILIGES MEER IN WESTPHALIA, W. Wichard, and H. Beyer.

Decheniana. Vol 125, No 1/2, p 43-48. 1972. Illus. Identifiers: Ecnomidae, *West Ge Identifiers: Ecnomidae, *West Germany(Westphalia), Hydroptilidae, Leptoceridae, Limnephilidae, Molamnidae, Phyrganeidae, Polycentropodidae, Psychomyiidae, Reservation areas, *Trichoptera, *Distribution patterns.

The distribution of Trichoptera species in surf and silted-up areas of the Heiliges Meer in Westphalia (West Germany) was determined from collections conducted from 1961-1970. Of the 36 spp. identified, Phyrganeidae, Hydroptilidae and Limnephilidae showed above average representation in silted-up areas, while the representation of Polycentropodidae and Ecnomidae was medium, and that of Leptoceridae, Molamnidae and

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Psychomyliidae was below average. The populations of Trichoptera in water areas decreased in the order Psychomyiidae, Leptoceridae, Molamnidae, Economidae, Polycentropodidae, Limne-Biological Abstracts, Inc.
W74-07997

ON SOME ASPECTS OF THE PARASITES OF CEYLONESE FRESH WATER CRABS,

Ceylon Univ., Colombo. Dept. of Parastitology. D. W. W. Kannangara.

Ceylon J Sci Biol Sci. Vol 10, No 1, p 32-38, 1972.

Identifiers: Achillurbainia-Sp, *Ceylon, *Crabs, Metacercariae, Nematode, Paraclepsis - Vul-nifera, *Paragonimus-Spp, *Parasites(Crabs), nifera, *Paragonimus-Spp, *Parasites(Cral Pleurogenoides-Sitapurii, Spirurid, Trematode.

The parasites found in Ceylonese freshwater crabs are described. They include larval stages of 3 spp. of Paragonium, a species of Achillurbainia, Pleurogenoides sitapurii, 8 other unidetntified trematode matacercariae, a larval spirurid nematode, an encysted nematode larva, an adult nematode and the leech Paraclepsis vulnifera. A brief note is added on in vitro development of the Pleurogenoides sitapurii metacercaria .-- Copyright 1973, Biological Abstracts, Inc. W74-08002

TRICLADIUM VARIUM, AN AQUATIC HYPHOMYCETE ON WOOD IN WATER-

COOLING TOWERS,
Portsmouth Polytechnic (England). Dept. of Biological Sciences.

E. B. Gareth Jones, and R. J. Stewart.

Trans Br Mycol Sol., Vol 59, No 1, p 163-167. 1972 Illus

Identifiers: *Aquatic plants Beech. Ceratosphaeria-Lampadophora, Dactylella-Sp. Growth, Humicola-Alopallonella, Humicola-Sp, *Hyphomycetes, Monodictys-Sp, Morphology. Nais-Inornata, Phaenectriella-Lignicola, Pine(Scotch), Reproduction, Septonema-Hormiscium, Spores, Tricladium-Angulatum, Tricladium-Attenuatum, *Tricladium-Varium.

Tricladium varium sp. nov. is described. Details of growth on beech and Scots pine test blocks are given for this species and Ceratosphaeria lampadophora, Monodictys sp., Humicola sp. and H. alopallonella, Septonema hormisclum, Dactylella sp., Nais inornata, and Phaenectriella lignicola.
Spore measurements of T. varium, T. angulatum. and T. attentuatum are given with information on growth and reproduction of T. varium on various media at various temperatures.--Copyright 1973, Biological Abstracts, Inc. W74-08011

EFFECT OF THE MOISTURE AND TEMPERA-TURE ON THE LEACHING OF ASH ELE-MENTS FROM PLANT RESIDUES (IN RUS-SIAN), Moscow State Univ. (USSR). Dept. of Pedology.

N. N. Bolyshev, and V. S. Gromova. Vestn Mosk Univ Ser 6 Biol Pochvoved. Vol 27, No 5, p 70-75, 1972. English summary.

Identifiers: *Ash elements, *Decomposition(Plant residues), *Leaching, Moisture, *Potassium, *Sodium, Solubility, Temperature.

Intensive decomposition of wet plant residues is affected by high temperature (38 deg, 70 deg), the higher the moisture content the greater amounts of ash elements became extractable by water. Low temperatures (40 deg, -70 deg) increase the solubility of Na and K.--Copyright 1973, Biological Abstracts, Inc. W74-08016

MODEL FOR ESTIMATING SOIL WATER, PLANT, AND ATMOSPHERIC INTERRELATIONS: I. DESCRIPTION AND SENSITIVITY, Utah Water Research Lab., Logan. For primary bibliographic entry see Field 2G.

MODEL FOR ESTIMATING SOIL WATER. PLANT, AND ATMOSPHERIC INTERRELA-TIONS: II. FIELD TEST OF MODEL, Utah Water Research Lab., Logan. For primary bibliographic entry see Field 2G. W74-08085

USE OF MORSHIN MINERAL WATER IN DIS-EASE OF THE LIVER AND BILIARY TRACTS IN CHILDREN, (IN UKRAINIAN), Meditsinskii Institut, Kiev (USSR).

P. O. Velychkovs'kyi, R. Yu. Kol'ner, and R. Ye. Samoilovych.

Pediatr Akush Hinekol. Vol 33, No 6, p 8-10, 1971. Identifiers: Biliary tract(Human), Cholepathia, *Hepatitis, Liver, *Mineral *USSR(Morshin spring), *Human diseases.

Observations were made on 113 children with chronic hepatitis (44) and cholepathia (69) who received as part of treatment mineral water prepared from the Morshin spring. The expediency of this brine for therapeutic purposes is substantiated by the indices of the clinical improvement of the condition of the patients and laboratory data obtained before and after treatment, and also by the advantage of this mineral water over other such waters in the simplicity of its use, cheapness and transportability.--Copyright 1973, Biological Abstracts, Inc. W74-08101

TREATMENT OF CHILDREN WITH CHRONIC HEPATOANGIOCHOLECYSTITIS AT THE LAKE UCHUM HEALTH RESORT,

Meditsinskii Institut, Tomsk (USSR) L. S. Chueva.

Vopr Kurortol Fizioter Lech Fiz Kul't. Vol 36, No 6, p 554-555, 1971. Identifiers: Brine baths, *Cholecystitis, Chronic diseases, Lakes, Mud, Resorts, *USSR(Lake Uchum), Human diseases.

An investigation of 86 children with chronic hepatoangiocholecystitis treated at the Lake Uchum health resort by means of mud applications, brine baths and inductothermopelo-therapy showed that the last method is most effective according to clinical and laboratory results.--Copy-right 1973, Biological Abstracts, Inc. W74-08102

(COLEOPTERA GROUND REETLES CARABIDAE) FROM THE BOGGY AREAS OF THE CRIMEA, (IN RUSSIAN),

Akademiya Nauk URSR, Kiev. Instytut Zoologii. A. A. Petrusenko, and S. V. Petrusenko.

Vestn Zool. Vol 7, No 1, p 30-33, 1973. English summary

Boggy Identifiers: areas. *Carabidae. *Ground beetles, Invertebrates, Coleoptera. *USSR(Crimea), Vertebrates.

Species composition of ground beetles and ecological and zoogeographical analyses of Carabida fauna from the bog areas of the Crimea (USSR) are presented. Biocenotic relations of ground beetles with different invertebrates and vertebrates living here substantiate the peculiarity of the bog habitat (plavni, bed kettle, spring fens) as an inde pendent unit enjoying equal significance with other flood-plain biogeocenoses of the penisula.— Copyright 1973, Biological Abstracts, Inc. W74-08103 DATA ON THE REPRODUCTION OF THE STRIPED RIFFLE MINNOW (ALBURNOIDES TENIATUS KESSER) IN THE ZERAVSHAN RIVER, (IN RUSSIAN), E. V. Kiseleva.

Tr Samark Univ. 211. p 57-61, 1972. Identifiers: Age, Alburnoides-Teniatus-Kesser, Length, Minnows, *Reproduction, Rivers, *Striped riffle minnows, Temperature, *USSR(Zeravshan River), Weight.

A total of 108 female striped riffle minnows (Alburnoides teniatus kesser) (length 135-180 mm, weight 25-75 g, age 3-6 yr) were collected. The time of reproduction varied and depended on the water temperature. The absolute and relative fecundity increases with age and increase of body. weight of the female .-- Copyright 1973, Biological Abstracts, Inc. W74-08104

GAMBUSIA IN THE ZERAVSHAN RIVER BASIN, (IN RUSSIAN).

E. V. Kiseleva

Tr Samark Univ. 211. p 51-57, 1972. Identifiers: Basin, Crustaceans, Fish, Food, *Gambusia, Insects, Larvae, *Reproduction, Rivers, *Sexual variability, *USSR(Zeravshan

The Gambusia inhabiting the Zeravshan river basin (USSR) is characterized by variability related to sex. Plants, insect larvae, crustaceans, and fish comprise the food of the gambusias. Reproductive rate is rather high, I female giving birth to about 217 embryos/liter.--Copyright 1973, Biological Abstracts, Inc. W74-08105

REGULARITIES OF THE GROWTH OF THE BODY AND BRAIN OF THE COMMON CARP IN BODIES OF WATERS OF THE AMU-DAR'YA DELTA, (IN RUSSIAN), THE AMU-

A. B. Baimuratov

R. B. Balludaudy, No 6, p. 69-74, 1972. Illus. Identifiers: Asia, *Brain weight(Fish), *Carp, Delta, Environmental conditions, *Growth, *USSR(Amu-Dar'ya delta), *Bioindicators.

A regular decrease was found in the relative weight of the brain of carp from different bodies water of the Amu-Dar'ya delta (Asia); the changes of the weight of the body and brain are specific for each individual population. The brain weight of the fishes can serve as an indicator of their environmental conditions.--Copyright 1973, Biological Abstracts, Inc. W74-08106

FRESHWATER FAUNA AND FLORA IN HASWELL ISLAND (QUEEN MARY LAND, EASTERN ANTARCTICA), Polish Academy of Sciences, Warsaw. Inst. of Ex-

perimental Biology. K. W. Opalinski.

Pol Arch Hydrobiol. Vol 19 No 4, p 377-381, 1972.

Identifiers: *Antarctica(Haswell Island), Bidulphia-sp., Birds, Charcotia-actinochilus, Chlorella-Antarctica, Eastern, *Fauna, *Flora, Fragilariopsis-Antarctica, Fragilariopsis-rhombica, Gloeocapsa-cohaerens-Antarctica, Gulls, Islands, Mineral, Organic matter, Oscillatoriales, Pen-guins, Prasiola, Rotatoria, Sediments, Tardigrada.

In December 1969, qualitative samples of organic sediments were drawn from the bottom of the freshwater lake in Haswell Island (Queen Mary Land, Eastern Antarctica). Numerous colonies of birds live in the island. The lakes in the island are supplied with several organic and mineral subsupplied with several organic and infineral sup-stances originating from guano of gulls and pen-guins. Among flora and fauna of the investigated lake, the following groups were found: Tardigrada and Rotatoria (2% of the total density of flora and

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fauna), Cyanophyta (53%), Diatomeae (23%) and Chlorophyta (17%). Only 2 among 19 plant species (Gloeocapsa cohaerens var. antarctica (Breb)
Wille (Cyanophyta) and Chlorella antarctica
(Fritsch) Wille (Chlorophyta)) are endemic plants in Antarctica. Among Diatomeae, 4 brackish species were found, characteristic for Antarctic seas (Fragilariopsis rhombica Hust., F. antarctica (Castr.) Hust., Charcotia actinochilus Hust, and Bidulphia sp.). These species were probably brought to the lake by birds. The inflow of allochthonic matter into lakes makes the development of nitrofil forms, such as Prasiola and Oscillatoriales, possible. The investigated lake is similar, as to its flora and fauna composition, to other lakes in the shore oases of Eastern Antarctica.--Copyright 1973, Biological Abstracts, Inc. W74-08107

INVERTEBRATE FAUNA OF THE BODIES OF WATER OF THE STATIONARY 'AGAPA'
(WESTERN TAIMIR). (IN RUSSIAN),
Moscow State Univ. (USSR). Dept. of Vertebrate

N M Shalaeva

Vestn Mosk Univ Ser 6 Biol Pochvoved, Vol 27. No 4, p 98-100, 1972. English summary.

Identifiers: Acanthocyclops-viridis, Asplanchnapriodonta, Biomass, Cyclops-strenuus, Daphniapulex, Eurycercus-glacialis, *Fauna, Heterocopeborealis, *Invertebrate, Lepidurus-arcticus, Stationary, *USSR(Taimir).

Altogether 12 lakes and 4 rivers were investigated for the species composition of zooplankton, bottom fauna and the fauna of the zone of vegetation beds. A list of all the invertebrate species recorded in the bodies of water of the stationary is given. The greatest variety of fauna was observed in middle Aug. This seemed also to be the period of its maximum biomass. In analyzing the general character of the hydrofauna a group of widespread forms is noted (Acanthocyclops viridis, Cyclops strenuus, Daphnia pulex, Asplanchna priodonta), and a number of species in herent in northern bodies of water (Heterocope borealis, Eurycercus glacialis, Lepidurus arcticus).--Copyright 1973, Biological Abstracts, Inc. W74-08110

STUDIES ON THE OCCURRENCE OF PLANK-TONIC ROTATORIA IN URBAN WATERS AND THEIR RELATIONSHIP TO SAPROBISM. (IN GERMAN), Hamburg Univ. (West Germany). Museum of

Zoology. H. Wilkens.

Mitt Hamb Zool Mus Inst. 68, p 1-20, 1972. Illus. English summary.

Identifiers: Anuraeopsis-fissa, Asplanchna-priodonta, Brachionus-angularis, Brachionus-capriodonta, Brachionus-augument, Brachionus-ur-lyciflorus, Brachionus-rubens, Brachionus-ur-priodonta, Brachionus-augument, Brachionus-ur-lyciflorus, Brachionus-augument, Brachionus-ur-lyciflorus, Brachionus-augument, Brachionus-ur-Keratella-cochlearis, Keratella-quadrata, *Plankton, Pollution, Polyarthra, Pompholyx-sulcata, *Rotatoria, *Saprobism, Synchaeta, *Urban

A series of planktonic rotifers can be observed in moderately as well as nonpolluted urban water: Keratella cochlearis, K. quadrata, Anuraeopsis fissa, Brachionus angularis, B. calyciflorus, As-planchna priodonta, Filinia longiseta, Pompholyx sulcata, Synchaeta and Polyarthra spp. Only one member of the community, B. calyciflorus, was found in heavily polluted conditions. All other rotifers to be observed here as well, B. urceolaris, B. rubens and Epiphanes senta, are littoral forms in nonpolluted waters, but they become planktonic and numberous in heavy pollution.--Copyright 1973, Biological Abstracts, Inc. ZOOPLANKTON OF FRESH AND BRACKISH WATERS OF THE BERING ISLAND (COMMANDER ISLANDS), (IN RUSSIAN), Moscow State Univ. (USSR). Dept. of Invertebrate Zoology.

Zool Zh. Vol 52, No 2, p 185-190, 1973. Illus. En-

olish summary.

Identifiers: Anostraca, Biomass, Brackish water, Cladocera, Copepods, Freshwater, Islands, Plankton, Rotifers, Succession, *USSR(Commander Islands), *Zooplankton.

Zooplankton of brackish water (Commander Island, USSR) consisted of rotifers (Notholcaacuminata, N. labis, N. foliacea, Synchaeta sp.) and a copepod Eurythemora Kusynchaeta sp., and a coperou Euryteiniola Au-renkovi. Lakes are usually populated by various rotifers (Filinia major, Keratella cochlearis, Polyarthra dolichoptera) and Cyclops scutifer. Small freshwater 'puddles' of the island can be di-vided into 3 groups: non-overgrown, weakly overgrown and strongly overgrown. Each of them is characterized by its own complex of zooplankton: non-overgrown snow type: Branchinecta paludosa (Phyllopoda), Acanthocyclops vernalis, Chydorus sp.; non-overgrown type: wide-spread lake rotifers (F. major, P. dolichoptera et al.) and copepods, few Cladocera; weakly overgrown type: lake and thicket rotifers (family Euchlanidae and Ascomorpha ecaudis) and Cladocera (Daphnia pulex, Bosmina longirostris, Simocephalus sibiricus); strongly overgrown type: numerous Cladocera and thicket rotifers, no lake rotifers. The community biomass grows during succession; diversity is insignificant in the beginning, then sharply increases and decreases at the final stages of succession .-- Copyright 1973, Biological Ab-

GROWTH FEATURE OF INTRODUCED PLANTS IN CONNECTION WITH THEIR PLANTS IN CONNECTION WITH THE ADAPTATION TO DROUGHT. (IN RUSSIAN), S. K. Kabulov.

Probl Osvoeniya Pustyn'. 1. p 80-82, 1973. English summary.

Identifiers: *Acer, Cessation(Growth), *Drought, Growth(Plants), *Padus, Spring, *Desert plants.

In spring, under favorable climatic conditions, plants (Acer, Padus) introduced into desert grow like the natives. Plants avoid atmospheric drought and its harmful influence on plant growth by assuming the state of delayed growth or stopping growth.—Copyright 1973, Biological Abstracts, Inc. W74-08118

EXPERIMENTS ON THE MOVEMENT BEHAVIOR OF UNICELLULAR ALGAE IN FLOWING WATER,

Oekologiska Stationen, Meassaure (Sweden). A. Mueller-Haeckel.

Hydrobiologia. Vol 41, No 2, p 221-246,1973. Illus.

English summary.

Identifiers: *Algae(Unicellular), Diurnal, Movement, Periodicity, Model studies, *Drift, *Algal growth, *Colonization(Algae). A schematic model is given of the drifting and recolonization of algal cells in an artifical channel

with algal growth on the bottom when water free of algae was flowing through, as well as of the colonization of a clean channel by algal cells, when water of a brook was flowing through. Both phenomena are compared with drift and colonization in a natural channel by means of quantitative samplying. Before settling down again after drift-ing awary, a single algal cell may cover a distance no greater than 38 m. Multiple sampling over a period of 24 hr demonstrated diurnal periodicity in the drifting and colonization of various algal spe-cies from running water.--Copyright 1973, Biologi-cal Abstracts, Inc. W74-08120

PHYTOSOCIOLOGICAL OBSERVATIONS IN INUNDATION ZONE FARMLANDS IN THE NORTHERN UPPER RHINE VALLEY, (IN GER-

A Oesau and H A Froebe

Beitr Naturkd Forsch Suedwestdtsch. 31, p 65-86. 1972. Illus.

Agrostideum-stoloniferae. Identifiers: Cyperetum-flavescenti, Cypero-limoselletum, Farmlands, Floods, *Inundation, Kickxietum, *Phytosociological studies, Polygono-bittingerichenopodietum-ru, Rorippo-silvestris, Setario, Valley, Veronicetum-politae, many(Upper Rhine Valley). *West

Phytosociological investigations of plow-lands in the inundation area of the Rhine in the Northern part of the Upper Rhine Valley (W. Germany) in 1970, following 2 consecutive floods in the same year revealed the associations Cypero-Limoselletum, Cyperetum flavescenti-fusci, Polygono bittingeri-Chenopodietum rubri, and Rorippo silvestris-Agrostideum stoloniferae in deep The associations identified in similar farmlands unaffected by flood are Setario-Veronicetum politae and Kickxietum .-- Copyright 1973, Biological Abstracts. Inc.

BIOLOGICAL CHARACTERISTICS OF THE VOLGA SCHOOL OF BELUGA AND STELLATE STURGEON, (IN RUSSIAN), I. M. Pashkin.

Tr Volgogr Otd Nauchno-Issled Inst Ozern Rechn Rybn Khoz. 6, p 28-47. 1972.

Identifiers: Acipenser-Huso, Age, *Beluga, Biological studies, Fecundity, Size, Spawning, *Stellate, *Sturgeon(Stellate), USSR(Volgagrad), Weight.

maximum concentrations of beluga (Acipenser huso) in the dam zone of the Volgograd (USSR) hydroelectric development (VHD) were observed in Oct. and remain at a high level until May. The size of the females was 181-320 cm (most often 220-270 cm) and of the males from 171-340 cm (190-270cm); females weighing 80-140 kg and males 50-110 kg predominate. The long stay of the fishes at the VHD had an adverse effect on the development of sexual products; mass resorption of eggs was observed. The fecundity of the Volga beluga increased markedly with increase of the size of the females: it was 250,000-400,000 eggs for fishes 200-220 cm long and 1.0-1.3 million eggs for those 280-300 cm long; the average fecundity/female for the present-day population structure was about 700,000 eggs. The age composition of the spawning population of the beluga was relatively constant, from 9-36 yr. The males of 1 generation participated in spawning for the first time within 11 yr and females 12 yr (both sexes, 17 yr); the beluga matured at an age of 15-23 yr, re-peated spawning occurred on the average after 5 r. The stellate sturgeon spawners appeared at the yr. The stellate sturgeon spawners appeared VHD in May, the maximum concentrations were found in June, and the total time of stay was about 60 days. The constant predominance of females and 'aging' of the spawning school on the whole was reflected in the change of the size-weight structure of the population of stellate sturgeons. The age of the stellate sturgeons in the region of the VHD was 8-26 yr (males aged 11-14 yr and females 15-18 yr predominated). Maturation of 1 generation occurred within 15 yr, ranging from 8-22 yr (females in 12 yr and males in 9). Repeated spawning occurred after 3-5 yr.—Copyright 1973, Biological Abstracts, Inc. W74-08126

EFFECT OF CLIMATIC AND PHYTOCENOTIC FACTORS ON ANNUAL INCREMENT OF TREES IN STANDS, (IN RUSSIAN),

Ural Science Center, Sverdlovsk (USSR). Inst. of Plant and Animal Ecology.

G. E. Komin. Ekologiya. Vol 4, No 1, p 74-83. 1973. Illus.

Group 21-Water In Plants

Identifiers: *Annual increment, Climatic factors, *Phytocenotic factors, *Trees(Stands).

Phytocenotic factors have a substantial effect on the dynamics of the annual increment of trees in dense stands, especially in multiple-species uneven-aged stands, close stands and successional stands. Therefore, the increment of trees from such stands cannot always be used as an indicator of changes of climatic elements in past years. When trees from dense stands are used, a prelimi-nary analysis is needed to ascertain that the increment of trees in them is determined to a greater degree by annually varying climatic factors than by phytocenotic factors.—Copyright 1973, Biological Abstracts, Inc. W74-08127

THE MOSS VEGETATION OF THE FORESTS IN THE RHINE LOWLAND BETWEEN BASEL AND MANNHEIM, (IN GERMAN), Landessammlunge fuer Naturkunde, Karlsruhe

(West Germany).

Beitr Naturkd Forsch Suedwestdtsch. 31, p 5-64. 1972. English summary.

Identifiers: Acidity, Anthropogenous, Deciduous trees, *Flooding, *Forests, *West Germany(Rhine lowland), Lowlands, *Moss, Pinus, Soils, Species, Vegetation

The moss vegetation of the forests in the Rhine lowland between Basel and Mannheim (W. Germany) is described. On periodically inundated localities on the bole of Salix alba and Populus canadensis the Tortulo-Leskeetum characterized by Leskea polycarpa, Tortula latifolia, Dia lytrichia mucronata and Zygodon viridissimus var. occidentalis is found. On the uninundated base of deciduous trees, the following moss communities are observed: Basi- to neutro-philous communities: the Neckero-Anomodontetum characterized Anomodon viticulous, A. attenuatus, Homalia by Anomodon viticulous, A. attenuatus, Homalia trichomanoides, Neckera complanata, Porella platyphylla, rarely Anomodon longifolius, especially in the subassociation with Homalia trichomanoides, the Mnietum cuspidati and the Brachythecietum populei, communities with Fissidens cristatus, Taxiphyllum depressum and Mnium stellare; acidophilous (to neutrophilous) communities: the Isothecietum myuri and a community with Dicranum viride. In the lower and munity with Dicranum viride. In the lower and middle part of the bole of deciduous trees the following moss communities are found: Basi- to neutrophilous communities: the Neckero-Anomodontetum, especially in the typical subas-sociation, the Leucodontetum sciuroidis, the Homalothecietum sericei and the Neckeretum crispae; acidophilous moss communities: the Isothecietum myosuroidis, the Dicrano-Hypnetum cupressiformis, the Dicranoweisietum cirratae and a community with Microlejeunea ulicina; other moss communities: the Pylaisietum polyanthae, the Ulotetum crispae and communities with Tortula papillosa and Orthotrichum obtusifolium (both introphilous). The frequency of the occurrence of epiphytic mosses on the single phorophytes and in the single forest communities was examined. The moss vegetation on the soil of the forest communities which is forming only synusia is described.-Copyright 1973, Biological Abstracts, Inc.

FLUCTUATIONS IN GULF OF MAINE SEA TEMPERATURE AND SPECIFIC MOLLUSCAN ABUNDANCE, Maine Dept. of Sea Shore Fisheries, Augusta.

J Cons Int Explor Mer. Vol 34, No 3, p 532-534. 1972, Illus.

Identifiers: *Gulf of Maine, *Sea temperature, *Mollusks, *Water temperature, *Clams.

The coefficient of correlation between mean annual sea temperature in the Gulf of Maine, and total annual production of hard clams from data

obtained for 37 yr is +0.73. The relationship of temperature to approximate natural abundance is noted in connection with predicting future abundance fluctuations by species based on longrange climate forests.--Copyright 1973, Biological Abstracts Inc. W74-08145

VEGETATION AND SOIL RELATIONSHIPS IN SOUTHERN BEAUFORT COUNTY, NORTH

Organisation for Tropical Studies, San Jose (Costa

For primary bibliographic entry see Field 2K. W74-08150

2J. Erosion and Sedimentation

OBSERVATIONS AND ANALYSIS OF BOTTOM TURBID LAYERS ON THE OREGON CONTINENTAL SHELF, Oregon State Univ., Corvallis. School of Oceanog-

rapny. P. D. Komar, L. D. Kulm, and J. C. Harlett. Journal of Geology, Vol 82, No 1, p 104-111, January 1974. 3 fig, 16 ref. USGS Contracts 14-08-001-10766, -11941, -12187 NSF Grant GA-32122.

Descriptors: *Turbidity currents, *Continental shelf, *Oregon, *Sediment transport, Suspended load, Littoral drift, Density currents, *Bottom

Turbid layers were observed on the Oregon continental shelf. These turbid layers are confined to valleys or swales, flowing around topographic highs. They are probably initiated by water cur-rents associated with surface and internal tides, wind-driven currents, and by sediment stirring due to surface wave activity. A velocity maximum is found within 2 m of the bottom, the velocity decreasing both toward the bottom due to bottom drag and upward in the water column. This nearbottom velocity maximum is produced by the flow of a turbid layer whose highest density core is within approximately 2 m of the bottom. The maximum velocity is approximately 20 cm/sec, but un-reasonably high sediment concentrations would be required to generate this velocity. Alternatively, the velocity maximum could be produced by a density flow of 3-5 cm/sec superimposed on a normal water current of about 15 cm/sec; these con-centrations and currents are reasonable for the Oregon shelf. Sedimentation rates off Oregon are highest on the lower continental slope and within submarine canyons, where they are several times higher than the adjacent upper continental slope. These slope deposits may be derived from turbid layer transport from the continental shelf. (Knapp-USGS) W74-07632

A DERIVATION OF THE HYDRAULIC GEOMETRY OF STEADY-STATE CHANNELS FROM CONSERVATION PRINCIPLES AND SEDIMENT TRANSPORT LAWS, University of Western Ontario, London. Dept. of

Geography.

Journal of Geology, Vol 82, No 1, p 98-104, January 1974. 1 fig, 5 ref.

Descriptors: *Channel morphology, *Sediment transport, Erosion, Sedimentation, Alluvial channels, Discharge(Water), Slopes, Velocity.

It is possible to build an analytical model of channel growth using necessary conditions for the existence of a river channel of finite width; namely, that sediment mass is conserved, that the channel form is sufficient to transport the water, and that the channel form is sufficient to transport the total load of sediment, using reasonable approximations to laws of sediment transport. The following

geometry is derived; channel width varies as the geometry is derived: channel width varies as the 0.6 power of Q; channel depth varies as the 0.3 power of Q; stream velocity varies as the 0.3 power of Q; and water slope varies as the -0.2 power of Q; where Q is the total stream discharge. (Knapp-USGS)
W74-07633

INVESTIGATION OF THE SEDIMENTS AND POTENTIAL MANGANESE NODULE RESOURCES OF GREEN BAY, WISCONSIN, Wisconsin Univ., Madison. Geo-Environmental and Mineral Resources Program.

J. R. Moore, R. P. Meyer, and C. L. Morgan. Wisconsin University Sea Grant Program Report WIS-SG-73-218, 1973. 144 p, 52 ref.

Descriptors: *Lake Michigan, *Wisconsin, *Bottom sediments, *Manganese, Mineralogy, Sedimentology, Bays, Sampling, Chemical recipitation. precipitation Identifiers: *Green Bay(Wisc), Manganese

A comprehensive survey was made of the sedi-A comprehensive survey was made of the sediments, sub-lake geologic structures, and manganese nodule resources of Green Bay, Wisconsin. A low-grade manganese resource in the form of small nodules (1.5 to 10.0 mm in diameter) was identified and mapped. While the manganese content varies from 4.4% to 16.0% by weight, the nodules in themselves are of potential economic value due to their high specific surface area and mossible use in catalysis and chemical adsorption. possible use in catalysis and chemical adsorption applications. The Mn-rich nodules are largely confined to two sites in the middle bay area, and the largest nodules--potentially useful in adsorption processes--are confined to the area around Sturgeon Bay. A fairly strong correlation was found between Mn and Mg, Sr, and Ba. The Green Bay sands are predominantly quartzose and feldspathic with low concentration of carbonate minerals. (Knapp-USGS)
W74-07652

GEOLOGICAL INVESTIGATIONS.

Westinghouse Electric Corp., Pittsburgh, Pa For primary bibliographic entry see Field 5B. W74-07657

EVOLUTION OF MEANDER LOOPS,

Washington Univ., St Louis, Mo. Dept. of Earth

Geological Society of America Bulletin, Vol 85, No 4, p 581-586, April 1974. 6 fig, 15 ref.

*Meanders, *Stream Descriptors: *Channel morphology, Geomorphology, Sediment transport, Alluvial channels, Terrain analysis, Aerial photography.

The evolution of the meanders on reaches of 10 alluvial streams in the United States was reconstructed. A scheme for the evolution and classification of meander loops was derived from a study of the meandering pattern of 125 alluvial streams. In the main evolutionary trend, a low symmetrical arc of approximately constant curvature tends to increase in height but decrease in radius as it grows. When its length exceeds its radius, the arc is termed a simple symmetrical meander loop. A simple loop becomes asymmetrical by the growth on its perimeter of a second arc of constant curvature, which is commonly tangent to the first and curved toward the same side of the stream. A simple loop becomes compound when a second arc on its perimeter has developed into a loop. Four main categories of loops (simple symmetrical, simple asymmetrical, compound symmetrical, and com-pound asymmetrical) and about 16 form types are proposed. The compound loops are regarded as aberrant forms of indefinite radius and length, but the meandering patterns can be analyzed into simple loops whose properties can be measured and treated statistically. (Knapp-USGS)

Erosion and Sedimentation—Group 2J

W74-07661

SEDIMENT DISTRIBUTION IN A BEACH RIDGE COMPLEX AND ITS APPLICATION TO ARTIFICIAL BEACH REPLENISHMENT,

Geological Survey, Urbana, Ill. G. S. Fraser, and N. C. Hester.

Environmental Geology Note 67, March 1974. 26 p, 20 fig, 1 tab, 17 ref.

Descriptors: *Beach erosion, *Lake Michigan, *Illinois, *Erosion control, Coastal engineering, Shore protection.

Severe erosion of much of the beach ridge complex is occurring along the Illinois shore of Lake Michigan east of Zion and Waukegan. One proposed method for solving the problem involves replenishing the eroded shore, either by filling or feeding. The material supplied should match that now found on the shore, and the material must be available in sufficient quantities nearby to make the project economically possible. The sand body along the Illinois shore is approximately 7 miles long and 2.5 miles wide, including a subaqueous platform 1.5 miles wide, and it is as much as 35 feet thick, The subaqueous portion consists of an offshore segment of fine to very fine sand and a nearshore area where sand and granules occur. The shore material ranges from medium-sized sand to pebbles. West of the shore, medium-sized sands are found in dunes and on colian sand plains. Material similar to that currently being deposited on the shore is available in sufficient quantity for use in a replenishment program. (Knapp-USGS)

INFLUENCE OF OLDER RELIEF ON THE LO-CATION OF SAND WAVES IN A PART OF THE SOUTHERN NORTH SEA, British Petroleum Co. Ltd., Sunbury-on-Thames (England). Research Centre.

V. N. D. Caston, and A. H. Stride. Estuarine and Coastal Marine Science, Vol 1, No. 4, p 379-386, October 1973. 4 fig, 1 plate, 20 ref.

Descriptors: *Sand waves, *Sounding, *Atlantic Ocean, Surveys, Sediment transport, Ocean currents, Tides. Identifiers: *North Sea.

A field of large sand waves occupies much of the southern bight of the North Sea. The large sand waves occur as narrow tongues up to about 11.5 km long by 3.5 km broad, which lie between low, northerly-trending ridges presumed to be of Pleistocene age. Evidence of the growth of a new sand wave implies an effective localized movement of the boundary of 1,450 m to the north. (Knapp-USGS) W74-07676

THE ROLE OF SEDIMENT GRADATION ON CHANNEL ARMORING,
Georgia Inst. of Tech., Atlanta. Environmental

Resources Center.

Resources Center.

W. C. Little, and P. G. Mayer.

Available from the National Technical Information Service as PB-232 164, \$9.25 in paper copy, \$1.45 in microfiche. Report No ERC-0672, May 1972, 104 p, 34 fig, 20 tab, 21 ref, 1 append.

Descriptors: *Channel erosion, Stream erosion, Scour, Channel morphology, *Stream stabilization, Erosion control, *Sediment transport. Identifiers: *Channel armoring.

The effects of sediment gradation on channel armoring were systematically investigated. A geometric mean diameter of 1.0 mm was used for sediments with geometric standard deviations of 1.12, 1.50, 2.00, 2.50, and 3.00 mm. These five mixtures of crushed quartz were each placed in a flume, and depths and flows were kept constant to induce armoring. The armour was considered stable when the sediment transport rate dropped to less than one percent of the initial rate. The surface layer of particles was then removed by the wax method and the distribution of the armored particles determined. An empirical equation was developed relating the properties of the original and armored sediment distributions to the flow properties. The geometric mean diameter of the armored material is calculated from flow conditions and sediment properties. Criterion was also developed to determine if a sediment bed will armor for given sediment and flow properties. With the broadly graded materials where channel armoring occurred, the bed degraded uniformly along its length. For uniform materials, little armoring could be induced, and the bed degraded more at the entrance and less at the outlet end resulting in a reduced bed slope. Armoring of the surface had no significant change on the average bed shear stress throughout the armoring process. After an 'armor coat' had developed, sediment transport continued at a low rate for a long time. This transport was by scour of fine material 'hiding' in the wake or zone of separation of the large particles. (James-Georgia Tech) W74-07731

TRANSPORT OF RADIONUCLIDES IN SEDI-

Department of Energy, Mines and Resources, Burlington (Ontario). Canada Center for Inland Waters.

For primary bibliographic entry see Field 5B. W74-07814

SEDIMENT TRANSPORT BY STREAMS IN THE UPPER COLUMBIA RIVER BASIN, WASHINGTON, MAY 1969-JUNE 1971,

Geological Survey, Tacoma, Wash.

L. M. Nelson.

Water-Resources Investigations 39-73, 1974. 69 p, 11 fig, 22 tab, 12 ref.

Descriptors: *Sediment transport, *Columbia River, *Washington, *Sediment yield, Sediment discharge, Suspended load, Bed load, Land use, Soil erosion.

Identifiers: Columbia Plateau(Wash), Columbia River basin.

Sediment transport by streams in the upper Columbia River basin of eastern Washington was studied from 1969 to 1971. In the mountainous areas snowmelt transports most of the sediment during April through June. In the lower, semiarid parts of the basin most of the sediment is transported when warm rain falls on extensive accumulations of snow. During the 1970 and 1971 water years the measured suspended-sediment concentrations ranged from less than I mg per liter in many streams to more than 200,000 mg per liter in Providence Coulee. The estimated long-term annual suspended-sediment yields range from less than 10 tons per square mile in many basins to more than 500 tons per square mile in Providence Coulee. Man's activities have caused only a slight increase in the magnitude of sediment discharge to the Columbia River. Although cultivation has initiated a large increase in erosion on the Columbia Plateau, the sediment transport by streams has not increased greatly, because there is little surface runoff on the plateau to transport soils to streams. (Knapp-USGS) W74-07911

PATTERNS OF WATER FLOW AND SEDI-MENT DISPERSION ADJACENT TO AN EROD-ING BARRIER ISLAND,

Skidaway Inst. of Oceanography, Savannah, Ga.

G. F. Oertel.

Georgia Marine Science Center, Skidaway Island, Technical Report Series No 73-9, January 1974. 35 p, 19 fig, 2 tab, 9 ref.

Descriptors: *Sediment transport, *Tides, Littoral drift, *Georgia, Currents(Water), Sands, Bottom sediments, Beaches, Continental shelf. Identifiers: *Tybee Island(Ga).

Hydrography and sediment transport were studied adjacent to Tybee Island, Georgia, to illustrate the role of tidal currents and residual currents in producing sediment transport patterns. Onshore currents associated with the flooding tide are the important mechanisms of sediment transport toward the Savannah River entrance. At two sta-tions, there was a net flow of water in one direction and a potential net transport of sediment in the opposite direction. (Knapp-USGS) W74-07920

DELIMITATION OF WEATHERING ZONES IN THE FIORD AREA OF EASTERN BAFFIN ISLAND, CANADA, Colorado University, Boulder. Inst. of Arctic and

Alpine Research.

S. J. Boyer, and D. R. Pheasant. Geological Society of America Bulletin, Vol 85, No 5, p 805-810, May 1974. 5 fig, 8 tab, 10 ref. NSF Grants GA-20883 and GA-10992.

Descriptors: *Weathering, *Arctic, *Soil forma-tion, *Canada, Statistical methods, *Distribution patterns, Mineralogy, Fjords. Identifiers: *Baffin Island(Canada).

Three weathering zones are delimited near Maktak and Narpaing Fiord, Baffin Island. Detailed sampling of weathering characteristics in Maktak Fiord and subsequent use of character analysis and discriminant analysis techniques supports the tri-zonal classification. The best combination of weathering characteristics for use in statistical delimination of weathering zones was tested by multiple stepwise discriminant analysis procedures. Weathering zones appear to have a regional distribution. The zones are stratigraphic units that can be used as a framework upon which a late Cenozoic history of the Cumberland Peninsula and perhaps eastern Baffin Island could be constructed. (Knapp-USGS) W74-07937

RANGER SUBMARINE SLIDE, NORTHERN SEBASTIAN VIZCAINO BAY, BAJA CALIFOR-NIA, MEXICO, Minnesota Univ., Minneapolis. Dept. of Geology

and Geophysics. W. R. Normark.

Geological Society of America Bulletin, Vol 85, No 5, p 781-784, May 1974. 5 fig, 1 tab, 16 ref.

Descriptors: *Landslides, *Mass wasting, *Sediment transport, *Mexico, Continental shelf, Bottom sediments. Identifiers: *Baja California, *Submarine land-

Ranger submarine slide, on the upper continental Ranger submarine slide, on the upper continental slope of the Pacific margin of Baja California, Mexico, covers more than 300 sq km. The slide involves partially indurated, late Pliocene and younger hemipelagic muds which moved down a 3 deg slope in late Pleistocene time. A detailed bathymetric survey of the surface of sliding and slide sheet shows that the sediments, which were as much as 125 m thick, moved down a gently folded, disconformable surface on probable Miocene sedimentary rock. The slide was probably initiated by earthquakes occurring within the Sebastian Vizcaino Bay region. (Knapp-HSGS) W74-07938

TIDAL CURRENTS AND ZIG-ZAG SAND SHOALS IN A WIDE ESTUARY ENTRANCE, Old Dominion Univ., Norfolk Va. Inst. of Oceanography.
For primary bibliographic entry see Field 2L. W74-07939

Group 2J-Erosion and Sedimentation

PROCESSES, PROCEDURES, AND METHODS TO CONTROL POLLUTION RESULTING FROM ALL CONSTRUCTION ACTIVITY. Hittman Associates, Inc., Columbia, Md. For primary bibliographic entry see Field 5B.

2K. Chemical Processes

EFFECT OF MONOSILICIC ACID ON HYDROLYTIC REACTIONS OF ALUMINUM, Saskatchewan Univ., Saskatoon. Inst. of Pedolo-

gy. For primary bibliographic entry see Field 2G.

FIXATION OF ZINC BY CLAY MINERALS, Georgia Agricultural Experiment Station, Athens. For primary bibliographic entry see Field 2G. W74-07629

ANION EXCLUSION AND COUPLING EFFECTS IN NONSTEADY TRANSPORT THROUGH UNSATURATED SOILS: II. LABORATORY AND NUMERICAL EXPERI-

Agricultural Research Organization, Bet-Dagan (Israel). Dept. of Soil Physics. For primary bibliographic entry see Field 2G.

W74-07631

ANION ADSORPTION BY ALLOPHANIC TROPICAL SOILS: I. CHLORIDE ADSORP-ALLOPHANIC TION.

California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 2G.

W74-07634

ANION ADSORPTION BY ALLOPHANIC TROPICAL SOILS: II. SULFATE ADSORP-

California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering. For primary bibliographic entry see Field 2G. W74-07635

ANION ADSORPTION BY ALLOPHANIC TROPICAL SOILS: III. PHOSPHATE ADSORP-

California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering. For primary bibliographic entry see Field 2G. W74-07636

QUALITY OF SURFACE WATERS IN THE COLORADO RIVER BASIN, TEXAS, 1966-72 WATER YEARS,

Geological Survey, Austin, Tex. For primary bibliographic entry see Field 5B.

QUALITY OF SURFACE WATER IN ILLINOIS,

Illinois State Water Survey, Urbana. For primary bibliographic entry see Field 5A. W74-07678

METHODS OF MERCUROMETRIC IN. VESTIGATIONS, For primary bibliographic entry see Field 5A. W74-07695

HYDROGEOLOGIC INVESTIGATION OF A SANITARY LANDFILL IN STRATIFIED GLACIAL DRIFT,
Connecticut Univ., Storrs. Inst. of Water

For primary bibliographic entry see Field 5B.

DELIMITATION OF WEATHERING ZONES IN THE FIORD AREA OF EASTERN BAFFIN ISLAND, CANADA, Colorado University, Boulder. Inst. of Arctic and

Alpine Research.
For primary bibliographic entry see Field 2J.
W74-07937

SOME NOVEL COMPLEXES OF CHROMI-

UM(I), Leeds, Univ. (England). Dept. of Inorganic and Structural Chemistry. For primary bibliographic entry see Field 5A.

URANIUM, THORIUM, AND LEAD CONCENTRATIONS IN THREE SILICATE STANDARDS AND A METHOD OF LEAD ISOTOPIC ANALY-

Geological Survey, Denver, Colo.
M. Tatsumoto, R. J. Knight, and M. H. Delevaux.
Professional Paper 800-D, p D111-D115, 1972. 5

Descriptors: *Isotope fractionation, *Heavy metals, *Rocks, *Standards, Analytical techniques, Chemical analysis, Lead, Thorium, Uranium, Basalts, Minerology, Samples, Laboratory tests, Measurements, Evaluation.

Lead, uranium and thorium concentrations in U.S. Geological Survey rock standards, BCR-1 (basalt) and AGV-1 (andesite) and in a basalt standard distributed by the National Aeronautics and Space Administration, were determined by the isotope Administration, were determined by the dilution procedure. Concentrations were 1.73 ppm U, 5.99 ppm Th and 13.56 ppm Pb in BCR-1; 1.96 ppm U, 6.27 ppm Th and 36.53 ppm Pb in AGV-1; and 1.87 ppm U, 6.42 ppm Th and 5.13 ppm Pb in the NASA basalt. A comparison of lead contents for BCR-1 and the origional split sample indicated that the standard was contaminated by lead; however, homogeneity of the sample was established and variation of the concentration was less than 1%. A new technique for isotopic analysis of lead, the silica gel-phosphate method, was tested for analytical uncertainties. The lead isotopic composition for BCR-1 obtained by the method using double-spike fractionation correction is Pb 206/Pb 204 = 18.794, Pb 207/Pb 204 = 15.610, and Pb 208/Pb 204 = 38.660. (Jerome-Vanderbilt) W74-07947

AN INSTRUMENTAL TECHNIQUE FOR THE DETERMINATION OF SUB-MICROGRAM CONCENTRATIONS OF MERCURY IN SOILS, ROCKS, AND GAS, Geological Survey, Denver, Colo. W. W. Vaughn, and J. H. McCarthy, Jr. Professional Paper 501-D, Geological Survey Research, p D123-D127, 1964. 3 fig, 2 tab, 5 ref.

Descriptors: *Instrumentation, "Geological surveys, "On-site investigations, Soil investigations, Metals, Gold, Analytical techniques, Rocks, Gases, Sampling, Testing, techniques, according to the control of the control

In the technique described and evaluated, detection of mercury is based on the principle of atomic absorption. An analog signal, produced when mercury vapor absorbs ultra-violet light, is converted to digital form and calibrated to mercury concen-tration. Interferences are eliminated by selectively trapping the mercury on gold. The lower limit of sensitivity, using a 1-gram sample, is 5 parts per billion. A model of the instrument mounted in a station wagon has been tested successfully in the field. (Olesziewicz-Vanderbilt) DETERMINATION OF MERCURY IN VEGETA-TION WITH DITHIZONE - A SINGLE EXTRAC-TION PROCEDURE, Geological Survey, Denver, Colo. For primary bibliographic entry see Field 5A.

IRON AND ASSOCIATED TRACE MINERAL PROBLEMS IN MAN AND ANIMALS, Food and Drug Administration, Washington, D.C. Div. of Nutrition.

J. C. Fritz. Geological Society of America Bulletin, Vol 83, p 805-812, March, 1972, 5 tab, 51 ref.

Descriptors: *Iron, *Trace elements, *Human pathology, *Nutrient requirements, Animal pathology, Foods, Diets, Hazards, Livestock, Farms, Nutrients, Public health, Deficient ele-

Identifiers: Anemia, Iron deficiency.

There is a high incidence of iron-deficiency anemia in the United States and throughout the world. The prevalence is high in adult women and infants because of their greater needs for iron. The typical human diet furnishes less than 6 mg iron per 1,000 kcal and does not meet the current recommended dietary allowance for critical groups because so much of the iron in whole, raw foodstuffs is removed in processing. Farm animals fare better because they receive fractions removed from human foods. A few livestock groups, notably baby pigs, do need supplemental iron. The cereal enrichment program failed to alleviate human anemia because of reduced consumption of cereals and because poorly utilized sources of supplemental iron were employed. The source of supplemental iron had more influence on bio-availability than did other diet components. It is recommended that the level of iron be increased in enriched cereals, that milk and other foods be fortified with iron, and that iron sources with good bioavailability be used in the fortification program. (Oleszkiewicz-Vanderbilt)

QUANTITY AND QUALITY OF SURFACE WATER IN MARION COUNTY, FLORIDA, Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 7C. W74-08044

AN OSCILLATOR CIRCUIT FOR AUTOMATED SALINITY SENSOR MEASUREMENTS, Agricultural Research Service, Riverside, Calif. For primary bibliographic entry see Field 2G. W74-08074

EFFECT OF HUMIDITY AND TEMPERATURE ON MICROBIAL ACTIVITY IN MOOR PEAT SOILS, (IN RUSSIAN), For primary bibliographic entry see Field 2G. W74-08089

IONIC ACTIVITY COEFFICIENTS IN WATER SOLUTIONS CALCULATED BY MEANS OF NOMOGRAPHS,

A. Zanker. Water Research, Vol 6, No 2, p 191-195, February, 1972. 2 fig, 2 ref.

Descriptors: *Ions, *Ion exchange, Solubility, Soil chemistry, *Water chemistry.

knowledge of ionic activity coefficients is a matter of importance in water research. The ionic activity coefficients in water solutions are funcactivity Coefficients in water solutions are func-tions of the ionic strength, the valency of the ion, and the effective ionic radius (for low ionic strengths only). (Skogerboe-Colorado State) W74-08093

Estuaries—Group 2L

EFFECT OF DILUTE SALT SOLUTIONS ON CHERNOZEM SOIL ESTIMATED THROUGH THE HYDRATION PROPERTIES OF THE COL-LOIDS

Indian Inst. of Tech., Kharagpur. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2G.

W74-08135

VEGETATION AND SOIL RELATIONSHIPS IN SOUTHERN BEAUFORT COUNTY, NORTH CAROLINA.

Organisation for Tropical Studies, San Jose (Costa

Rica). G. S. Hartshorn.

J Elisha Mitchell Sci Soc. Vol 88, No 4, p 226-238.

1972 Illus

Acer-Rubrum, Bitterlich, Drainage, Identifiers: Fagus-Grandifolia, Hardwoods, Liquidambar-Styraciflua, Liriodendron-Tulipifera, *North Carolina(Beaufort County), Nyssa-Sylvatica-Var-Biflora, inus-Palustris, Pinus-Taeda, Quercus-Alba, *Soil analysis, *Physiochemical analysis, *Forest stands, *Vegetation.

Analyses of vegetation and soils in 27 forest stands in southern Beaufort County, North Carolina were made. The Bitterlich variable plot radius method was used to sample relatively undistrubed stands. Plants in the shrub and herbaceous layers were sampled by square quadrat. Samples of the predominant soil type in each stand were subjected to several physical and chemical analyses. Texture and lack of drainage were determined to be the dominant soil features determining vegetation patterns. As a result of the marked influence of texture and drainage on vegetation and the presence of large areas of disturbed forest and plantations, vegetation patterns were developed for 3 soil families. The clayey, mixed, thermic family and the fine-loamy, mixed, thermic family differ only slightly in texture and have Pinus taeda, Liquidambar styraciflua and Liriodendron tulipifera as predominant trees. In addition, Fagus grandifolia, Quercus alba and other mesic species are important on the better-drained sites, while Nyssa sylvatica var. biflora and Acer rubrum are important on the wetter sites. A strinkingly dif-ferent vegetation pattern occurs on the siliceous, thermic family associated with the Suffolk Scrap, a Pleistocene shoreline. P. taeda or P. palustris dominates the better-drained sites. A seepage zone on both flanks of the sand ridge is dominated by evergreen bays: Persea borbonia, Gordonia la-sianthus and Magnolia virginiana. Four vegetation types are recognized: open pine, evergreen bay, swamp forest and pine-mixed hardwood (which was further differentiated into 3 phases: white oak, ravine slope and sweet gum-swamp tupelo).--Copyright 1973, Biological Abstracts, Inc. W74-08150

2L. Estuaries

COASTAL VEGETATION OF DELAWARE,

Delaware Univ., Newark. Coll. of Marine Studies. V. Klemas, F. C. Daiber, D. S. Bartlett, O. W. Crichton, and A. O. Fornes.

Available from the National Technical Informa-tion Service as COM-73-11537, \$3.00 in paper copy, \$1.45 in microfiche. Sea Grant Program Re-port DEL-SG-15-73, June 1973. 29 p, 4 fig, 7 ref.

Descriptors: *Mapping, *Wetlands, *Coasts, *Delaware, *Vegetation, Remote sensing, Aerial photography, Marshes, Swamps, Estuaries, Bays, Lagoons, Environment, Ecology, Planning, Land management.

Delaware's coastal wetlands were mapped as part of an evaluation of the relative value of different parcels of marsh and the settling of priorities for use of these marshes. The mapping approach re-lied heavily on aerial photography and multispec-tral analysis, utilizing conventional ground recon-

naissance only to aid and check the photointerpretation. Coastal wetlands of the type found along the entire East Coast of the United States are well suited to remote sensing techniques, par-ticularly multispectral analysis. The uniform flat-ness of marsh topography eliminates variations in reflectance due to sloping surfaces and shadows. The most common marsh plant species are few in number, thus simplifying photointerpretation. Environmental changes generally take place over large horizontal distances in the marsh; therefore zones of relatively uniform vegetation are usually large enough to be discernible even on very high altitude imagery. The major plant species are different enough in their morphologies to have distinct reflectance characteristics, particularly in the near-infrared portion of the spectrum. The net result is that multispectral imagery can be used to make detailed wetlands maps sowing vegetation growth patterns which are related to local environ-mental factors. The fifteen maps of Delaware's coastal zone which follow were prepared to show the dominant species or groups of species of vegetation present. (Knapp-USGS)
W74-07616

OBSERVATIONS AND ANALYSIS OF BOTTOM TURBID LAYERS ON THE OREGON CONTINENTAL SHELF, Oregon State Univ., Corvallis. School of Oceanog-

For primary bibliographic entry see Field 2J. W74-07632

USE OF FLUORESCENT DYE TRACERS IN MOBILE BAY, Food and Drug Administration, Dauphin Island, Ala. Gulf Coast Technical Services Unit.

For primary bibliographic entry see Field 5B. W74-07642

CHESTER RIVER STUDY, VOLUMES I, II, AND III.

For primary bibliographic entry see Field 5B. W74-07653

TRACE METALS INVESTIGATIONS, Westinghouse Electric Corp., Pittsburgh, Pa. For primary bibliographic entry see Field 5B. W74-07655

BIOLOGICAL INVESTIGATIONS. For primary bibliographic entry see Field 5B. W74-07656

GEOLOGICAL INVESTIGATIONS, Westinghouse Electric Corp., Pittsburgh, Pa. For primary bibliographic entry see Field 5B.

METEOROLOGICAL AND HYDROLOGICAL INVESTIGATIONS,

For primary bibliographic entry see Field 5B. W74-07658

DATA MANAGEMENT. For primary bibliographic entry see Field 5B. W74-07659

EQUIPMENT AND INSTRUMENTATION, For primary bibliographic entry see Field 5B. W74-07660

HETEROGENEITIES IN SALINITY IN A RIVER Delaware Univ., Newark. Coll. of Marine Studies.

K-H. Szekielda, and S. Kupferman. Estuarine and Coastal Marine Science, Vol 1, No 4, p 419-424, October 1973. 7 fig, 6 ref.

Descriptors: *Mixing *Deltas *Salinity Internal waves, Path of pollutants, Sea water, Sampling, Density currents.
Identifiers: *France(Rhone River).

Continuous and discrete measurements of salinity off the mouth of the Rhone River show the effects of wind induced mixing and of internal waves on the salinity structure. Vertical salinity changes of up to 2.5% in 1 meter and internal waves with periods of two to three minutes were observed in the upper meter of the water column. (Knapp-W74-07672

A SIMPLE, SEGMENTED PRISM MODEL OF TIDAL MIXING IN WELL-MIXED ESTUARIES, Institute of Oceanographic Sciences, Taunton (England).

K. R. Dyer, and P. A. Taylor. Estuarine and Coastal Marine Science, Vol 1, No

4, p 411-418, October 1973. 5 fig, 2 tab, 8 ref.

Descriptors: *Model studies, *Water circulation, Estuaries, Mathematical models, Saline water intrusion, Path of pollutants.

Identifiers: *United Kingdom(Thames Estuary),

Tidal prism models.

Segmented tidal prism models can incorporate mixing processes in an easily visualized, if over simplified, way. These models may be easily ex-tended to include the flushing of pollutants from estuaries, either from instantaneous or continuous sources. The model is restricted to well mixed estuaries. To illustrate the model a computation of the salinity distribution was made at a point 11.5 miles below London Bridge. (Knapp-USGS) W74-07673

CHEMICAL EVIDENCE FOR THE DISPERSAL OF RIVER MERSEY RUN-OFF IN LIVERPOOL

Liverpool Univ. (England). Dept. of Oceanog-For primary bibliographic entry see Field 5B. W74-07674

SIMILARITY SOLUTION FOR STEADY-STATE GRAVITATIONAL CIRCULATION IN

Washington Univ., Seattle. Dept. of Oceanography. D. F. Winter.

Estuarine and Coastal Marine Science, Vol 1, No 4, p 387-400, October 1973. 6 fig, 1 tab, 14 ref.

Descriptors: *Water circulation, *Fiords, Currents(Water), Estuarines, Stratified flow, Mathematical studies, Equations, Saline water intrusion, Path of pollutants, Convection, Density currents, *Washington, *Canada.
Identifiers: Hood Canal(Wash), Puget

Sound(Wash), Knight Inlet(B.C.-Canada).

The dominant circulation mode in fjords which receive ample freshwater runoff is gravitational convection, which takes place primarily near the surface in a brackish phase with one or two cur-rent reversals. Approximate analytic expressions were obtained for the velocity components and the density distribution in a fjord segment where condensity distribution in a profu segment where con-ditions for a similarity analysis are statisfied. The method is illustrated by applications to Hood Canal and the central basin of Puget Sound, Washington, and to Knight Inlet on the mainland coast of British Columbia, Canada. Comparisons of measured and computed salinity and velocity profiles indicate that the circulation patterns are solutions. The flow description given may be of use in studies of pollutant dispersal and biological production in fjords. (Knapp-USGS)
W74-0/675 reasonably well represented by the approximate

Group 2L—Estuaries

RESULTS OF RED TIDE FORMATION IN TOKYO BAY.

Tokyo Univ. (Japan). Faculty of Science For primary bibliographic entry see Field 5C.

CONCENTRATIONS OF MANGANESE, IRON, AND ZINC IN JUVENILES OF ESTUARINE-DEPENDENT FISHES. National Marine Fisheries Service, Beaufort, N.C. For primary bibliographic entry see Field 5C. W74-07803

PROCESS CONTROL MODEL FOR OXYGEN REGENERATION OF POLLUTED RIVERS, PHASES IV AND V, AND SPACIALLY AND TEMPORALLY DISTRIBUTED DISCHARGE OF EFFLUENTS IN ESTUARIES, Rutgers The State Univ., New Brunswick, N.J. Dept. of Chemical and Biochemical Engineers. For primary bibliographic entry see Field 5B. W74-07837

A STOCHASTIC MODEL FOR THE JAMES, Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center. For primary bibliographic entry see Field 5B. W74-07843

PLEISTOCENE-HOLOCENE SEDIMENTS IN-TERPRETED BY SEISMIC REFRACTION AND WASH-BORE SAMPLING, PLUM ISLAND-CAS-TLE NECK, MASS.,

Army Coastal Engineering Research Center, Fort Belvoir, Va. E. G. Rhodes

Technical Memorandum No. 40, July 1973. 75 p, 34 fig, 1 tab, 31 ref, 1 append.

Descriptors: Seismology, *Subsurface mapping, *Seismic studies, *Coasts, Marshes, Shores, Coastal structures, Islands, *Massachusetts, Sedimentation.

Identifiers: *Refraction seismology, *Wash-bore sampling, Barrier bar, Point bar, Estuaries, Pleistocene, Coastal environment, Barrier beach, Plum Island-Castle Neck(Mass).

Refraction seismology and the 'wash-bore' method of soil sampling were combined to define the geology and the three-dimensional geometry of the coastal environment near Plum Island - Castle Neck, Massachusetts. Although refraction seismology was successful in defining the geometry of the Pleistocene-bedrock interface, many of the problems inherent to the refraction technique were encountered. These problems, which generally led to ambiguous interpretations and poor data quality, included the occurrence of (1) a 'Blind zone,' (2) non-zero time intercepts, (3) severe interface geometries, and (4) apparent velocities. The appropriated field input and recording techniques necessary to minimize their unwanted effects are discussed. It was found that the bedrock topography was quite irregular and that it had played a dominant role in the geologic development of the coastal environment since the Pleistocene. Barrier islands were found to anchor on bedrock highs, while thick sequences of estuarine and marsh sediments accumulated in estuaries behind these barrier beaches. As sea level rose the estuarine and marsh sediments migrated landward behind the migrating barrier. (Martino-NWWA) W74-07875

PATTERNS OF WATER FLOW AND SEDI-MENT DISPERSION ADJACENT TO AN EROD-ING BARRIER ISLAND, Skidaway Inst. of Oceanography, Savannah, Ga.

For primary bibliographic entry see Field 2J.

A NUMERICAL STUDY OF THE STEADY CIR-

A NUMERICAL STUDY OF THE STEADY CIR-CULATION IN AN OPEN BAY, Florida State Univ., Tallahassee. Dept. of Oceanography., and Florida State Univ., Tallahas-see. Geophysical Fluid Dynamics Inst.

Sea. Hsuch, and C-Y. Peng.
Journal of Physical Oceanography, Vol 3, No 2, p
220-225, April 1973. 9 fig, 4 ref. NSF Grants GA26563 and GA-29374; ONR Contract N00014-67A-

Descriptors: *Water circulation, *Bays, *Continental shelf, Model studies, *Florida, Winds, Currents(Water), Path of pollutants, Numerical analysis, Tides.

The steady-state circulation in a rectangular bay was studied numerically in a model assuming homogeneous water and vertical coasts. The com-peting influences of surface winds and longshore currents flowing by the open side of the bay and the effects of the bathymetry are emphasized. For a wind-stress field that does not vary along the coast but decays linearly inshore from the open side of the bay, the mass-transport stream funcside of the bay, the mass-transport stream func-tion contours form a gyre rotating in the sense of the wind-stress curl. A uniform continental shelf slope distorts the gyre by creating depth variations that cause vortex stretching. Consequently, the streamlines become more packed to the right of the downslope direction. The nonlinearity tends to destroy symmetry by crowding streamlines in the direction of the induced current. The influence of large-scale ocean currents along the open side is normally confined to the outer half of the bay. When the wind is blowing against these currents, the influence of the wind creates two gyres, one each inshore corner of the bay. (Knapp-USGS)

RANGER SUBMARINE SLIDE, NORTHERN SEBASTIAN VIZCAINO BAY, BAJA CALIFOR-

Minnesota Univ., Minneapolis. Dept. of Geology and Geophysics. For primary bibliographic entry see Field 2J. W74-07938

TIDAL CURRENTS AND ZIG-ZAG SAND SHOALS IN A WIDE ESTUARY ENTRANCE, Old Dominion Univ., Norfolk Va. Inst. of J. C. Ludwick

Geological Society of America Bulletin, Vol 85, No 5, p 717-726, May 1974. 8 fig, 4 tab, 38 ref. ONR-GP Contract N00014-70-C-0083.

Descriptors: *Sediment transport, *Chesapeake Bay, Shoals, Sand bars, Shores, *Tides, *Currents(Water), Sedimentation, *Estuaries.

Zig-zag shoals extend from the north cape threefourths of the distance to the south across the entrance of Chesapeake Bay. This line of shaols consists of oppositely opening sinuses, or parabolas, which are alternately ebb dominated and flood dominated. The shoals represent spit-building action in the presence of strong reversing tidal cur-rents which are mutually evasive. Other shoals in the entrance are due to subaqueous levee building marginal to main channels. Still other shoals in the entrance are constructed when a flood-dominated channel intersects the ebb-directed path of net sediment transport; the interdicted sediment then is flushed landward to form a secondary shoal when spreading of the flood current occurs. At ebb strength, surface current speed ranges from 132 to 64 cm/sec; near-bottom speed ranges from 79 to 24 cm/sec. At flood strength, surface current speed ranges from 104 to 57 cm/sec; near-bottom speed ranges from 65 to 35 cm/sec. Near the bottom at more than half the stations, flood flow dominates over ebb flow in both peak speed and duration. At ebb strength, stress ranges from 185 to 13 dynes per sq cm. At flood strength, this stress ranges from 80 to 4 dynes per sq cm. Peak flows at all stations are competent to move bed sediment. Net transport of bed sediment usually is ebb directed. Prominent indentations, or sinuses, in the margins of shoals are strongly dominated by net sediment transport toward the closed end of a channel. (Knapp-USGS) W74-07939

MOLLUSCAN MORTALITY STUDIES, Maryland Dept. of Natural Resources, Annapolis. For primary bibliographic entry see Field 81. W74-07995

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

REVERSE OSMOSIS PROCESS AND ITS AP-PLICATION, (IN JAPANESE), For primary bibliographic entry see Field 5D. W74-07750

CELLULOSIC REVERSE OSMOSIS MEM-BRANES HAVING HIGH FLUX AND HIGH SALT REJECTION,

SALI REJECTION, Eastman Kodak Co., Rochester, N.Y. (Assignee) B. M. Brown, and E. L. Ray. U. S. Patent No 3,789,993, 5 p, 1 fig, 2 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 919, p 161, February 5, 1974.

Descriptors: *Patents, *Reverse osmosis,
Membranes, *Desalination, Water treatment, Descriptors: Water quality control.
Identifiers: Cellulose acetate, Formic acid.

The asymmetric cellulose ester reverse osmosis membrane is characterized by having only one active surface which can selectively exclude from passage under applied pressure dissolved sodium chloride ions. It has an integral porous substructure adjacent to the active surface with a substructure flux under 600 psi pressure of at least about 10,000 gallons of water per square foot per day. The membrane has 36 to about 41 percent combined acetyl and at least about one percent combined formyl and a porosity of at least 70 percent. (Sinha-OEIS) W74-08022

SYSTEM FOR REVERSED OSMOSIS. Industriele Onderneming Wavin, N.V., Zwolle (Netherlands). (Assignee) For primary bibliographic entry see Field 5D.

METHOD AND EQUIPMENT FOR DESALINA-TION OF LIQUIDS.

Mannesmann A.G., Duesseldorf (West Germany). (Assignee)

U. S. Patent No 3,796,320, 5 p, 3 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 920, No 2, p 393, March 12, 1974.

Descriptors: *Patents, *Desalination, *Filtration, *Water treatment, *Water purification, Water quality control, Ion exchange.

Liquids are desalinated in equipment from which filter material is continuously withdrawn, regenerated and mixed with the raw, saline liquid prior to charging the filter. The regenerated filter material may circulate through a post desalinated filter prior to recycling into the principal filter. Liquid to be desalinated is continuously contacted by fresh, regenerated ion exchange material and exhausted material is discharged from the filter on a continuous basis. The series connection or

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 3

Saline Water Conversion—Group 3A

cascading of two filters permits use of completely fresh and regenerated ion exchange material in the final and more critical desalination stage. The predesalinating filter is subdivided into an upper and lower chamber. Inflow of raw saline liquid is mixed with regenerated ion exchange material. The latter is flushed against the divider. Partially desalinated liquid is forced through nozzles in the divider. Separate drainage systems below and above the nozzle plate discharge desalinated or partially desalinated liquid from the filter container. (Sinha-OEIS) W74-08038

COMMERCIAL DESALTING PLANT DATA AND ANALYSIS, VOLUMES I-VI, DSS Engineers, Inc., Ft. Lauderdale, Fla. C. D. Hornburg, R. E. Bailie, O. J. Morin, and W.

Available from the National Technical Informa-tion Service as PB-226 808 SET/AS; \$27.00 in paper copy, \$1.45 in microfiche. Office of Saline Water, Reports INT-OSW-RDPR-74-906 thru 911, 1973. 1057 p, 181 fig, 106 tab, 43 ref.

Descriptors: *Desalination plants, *Data collections, Equipment, Failures, *Design, *Operating costs, Corrosion, *Corrosion control, *Waste water treatment, *Maintenance, Economics, Evaporators, Flash distillation, Sea water, Chemistry Wester, We cal analysis, Water utiliza Water costs, Iron, Copper. Water utilization, Waste disposal,

Identifiers: Operating experience, Virgin Island plants, Key West plant, Nassau plant.

A 6-volume report on commercial plant operating data and experiences. Separate volumes cover the following plants: 1.0 mgd, St. Croix; 1.0 mgd and 2.5 mgd, St. Thomas, 2.62 mgd, Key West; and 2.4 mgd. Nassau. Each volume includes background information covering water demand growth and plant history; design data, including flowsheets and layouts; reports on operational tests, visual inspections and eddy current testing of tubes; per-formance data and analysis for 3-year period; operating staff and their duties; documentation of material failures and corrosion of plant components; discussions of operating problems, in-cluding boilers, sea water supply, fouling and corrosion control problems; economic evaluations, including production cost analysis for a 3-year period; and steam allocation methods for dual-purpose plants. Each volume includes recommendapose piants. Each volume includes recommenda-tions on modifications, improvements, and procedural changes. The first volume summarizes and compares the 5 plants giving insight into actual operating experiences. A separate section of Volume I contains chemical analysis of effluents from the plants. Emphasis was placed on quanti-ties of iron and copper being discharged. (OSW) W74-08061

THE POTENTIAL OF DESALTING FOR INDUS-TRIAL WATER SUPPLIES IN NORTHEAST-ERN WYOMING.

R. L. Streeter.

Available from the National Technical Informa-tion Service as PB-226 649/AS; \$15.50 in paper copy, \$1.45 in microfiche. Office of Saline Water Report INT-OSW-74-904, June 1973. 281 p, 21 fig, 21 tab, 61 ref. (Prepared for Wyoming State En-gineer's Office). OSW Contract 14-30-2975.

Descriptors: *Desalination, Desalination plants, *Water supply, Water utilization, Water costs, *Wyoming, *Industrial water, Membrane processes, *Planning, *Feasibility studies, Ener-

Under the Wyoming Water Planning Program, various water and resources studies have been made of N.E. Wyoming. This report supplements that program. The area has great future industrial potential because of its coal deposits which are estimated at 95 billion tons of mapped reserves. This is one of the most arid parts of the state and, hence, water is a key to development. Hence, the State of Wyoming entered into a cooperative agreement with OSW to conduct a reconnaissance-level desalting of brackish waters to augment the meager water supplies. The objectives of the study were to identify potential industrial ap-plications, assess available water supplies, and prepare conceptual designs of water systems for identified applications and prepare reconnais-sance-level costs for the total system, whether desalting was required or not. A location was assumed for the coal plant (power or conversion).
For the plants, five potential groundwaters and six potential surface waters were evaluated. Reverse osmosis and electrodialysis were the desalting processes considered. It is concluded that in the long term importation of water will be required to fully develop the coal. For the short term, it will be necessary to depend on supplies available within the area. The report states that desalting must and will play an important role in this development. W74-08062

IMPROVING MUNICIPAL WATER SUPPLIES

IN ARIZONA BY DESALTING, Arizona Water Commission, Phoenix.

Available from the National Technical Information Service as PB-226 708/AS; \$13.50 in paper copy, \$1.45 in microfiche. Office of Saline Water, Report INT-OSW-74-919, March 1973. 212 p, 25 fig, 45 tab, 23 ref, 4 append. OSW Contract 14-30-2728.

Descriptors: *Desalination, Desalination plants, *Water supply, *Municipal water, Water costs, *Arizona, *Planning, Brackish water, *Feasibility

This report examines the technical and economic feasibility of applying desalting technology to pro-vide improved quality water supply to meet the future needs of selected communities in Arizona. Eight communities were selected for study as a representative cross-section of communities throughout the State with varying degrees of water quality, with the objective that the economic feasibility demonstrated would be applicable to other communities in the state with like water quality supplies. The selected communities were Apache Junction, Casa Grande, Gila Bend, Joseph City, Kearney, Parker, Safford, and Somerton. The study indicates that many Arizona communities could conceivably save money through the use of desalting. The study indicates that benefits to a community may exceed costs for desalting where water supplies exceed 1,000 ppm TDS, where the population exceeds 2,000 people and where the average family income equals or exceeds that for the State. It was concluded that a community which now has a satisfactory water supply but may need a future growth supply can economically justify desalting future saline sources which may be available. Processes found applicable to the various waters were ion exchange, electrodialysis, and reverse osmosis. (OSW)

POTENTIAL CONTRIBUTION OF DESALTING SYSTEFS TO MUNICIPAL WATER QUALITY AND SUPPLY IN SOUTH DAKOTA. Banner (J.T.) and Associates, Inc., Brookings, S.

Available from the National Technical Informa-tion Service as PB-226 719/AS; \$21.50 in paper copy, \$1.45 in microfiche. Office of Saline Water, Report INT-OSW-74-918, March 1973. 390 p, 67 fig, 73 tab, 40 ref, 13 append. OSW Contract 14-30-2804.

Descriptors: *Desalination, Desalination plants, *Water supply, *Municipal water, Water costs, Benefits, *South Dakota, *Planning, Brackish water, Computer programs, *Feasibility studies. This was a feasibility study performed under a cooperative agreement between the South Dakota Department of Health and the Office of Saline Water to determine the potential for desalting in South Dakota. Ten communities were selected for study from among 150 communities in South Dakota having water supplies of more than 1,000 ppm TDS. These communities were Bryant, Dupree, Eureka, Gettysburg, Lemmon, Madison, Miller, Parkston, Platte and Redfield. Following cost calculating procedures and criteria, desalting processes were selected for each loca-tion based on the most favorable costs. Economic benefits to the community were assessed and a description provided of each desalting process. For the electrodialysis process, cost comparisons are made with the electrodialysis plant at Webster, S.D. To facilitate calculations, a computer program was established and the program is detailed in an appendix. (OSW) W74-08064

THE FUTURE ROLE OF DESALTING IN NEVADA,

Southwest Research Inst., San Antonio, Tex.

W. L. Prehn.

Available from the National Technical Information Service as PB-226 760/AS; \$14.25 in paper copy, \$1.45 in microfiche. Office of Saline Water, Report INT-OSW-74-920, April 30, 1973. 234 p, 41 fig, 41 tab, 209 ref, 11 append. Prepared for Nevada Division of Water Resources. OSW Contract 14-30-2846

Descriptors: *Desalination, Desalination plants, Water supply, Municipal water, Water costs, *Nevada, *Planning, Brackish water, Geothermal studies, Water sources, *Feasibility studies.

An important aspect of the on-going development of the State Water Plan is the exploration of alter-native sources of water supply. The purpose of this report is to determine the feasibility of desalting in Nevada and review the potential for its fu-ture applications. Detailed cost information is presented on ten representative Nevada water supply situations. Five of these studies dealt with community or area water needs: Fallon, Gabbs, Hawthorne, the Logandale/Moapa Valley, and Mesquite/Bunkerville. Of the five remaining sites, three were oriented toward agricultural or wildlife management needs: a dual-purpose desalt/nuclear power plant at Carson Sink to provide water for an entire valley's needs; a plant at Fallon to provide municipal water for the city and surrounding area as well as for Stillwater wildlife management area needs; and reduction of the level of dissolved solids in Walker Lake in order to maintain a safe environment for the fishery. In addition, one study situation dealt with development of a geothermal resource, and the final study was comprised of a series of evaluations of small desalt plants suitable for use in ranch-type applications. For four of the sites, conventional sources appeared more economical. Opportunities are indicated for developing the geothermal resources and ranch type units. The appropriate process was selected for each site with consideration given to reverse osmosis, electrodialysis, ion exchange, distillation and freezing. (OSW) W74-08065

PRELIMINARY STUDY TO INVESTIGATE FEASIBILITY OF DESALTING GROUND WATER IN NORTH DAKOTA,

North Dakota State Water Commission, Bismarck.

T. C. Owens, A. M. Cooley, G. O. Fossum, and David Schaaf.

Available from the National Technical Information Service as PB-225 976; \$10.75 in paper copy, \$1.45 in microfiche. Office of Saline Water, Report INT-OSW-73-902, August 23, 1973. 163 p, 24 fig, 26 tab. OSW Contract 14-30-2875.

Field 3-WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3A—Saline Water Conversion

Descriptors: Costs, Brackish water, Conjunctive use, Municipal water, "North
"Desalination processes, Water
"Groundwater, "Economic feasibility,
quality, "Feasibility studies." Dakota. supply,

Groundwater in North Dakota is used by a large number of communities and by most of the farms in the state as a source of water. The quality of the water used varies widely, but very few community supplies satisfy the criteria established by the U.S. Public Health Service. The quality of water availa-ble for domestic uses on farms is probably lower because of the need for a well in close proximity to the farm buildings. The technical and economic feasibility of desalting groundwater for domestic, agricultural, and industrial purposes has been studied. The costs of desalting groundwater by a number of methods to provide municipal water for eleven communities were estimated. In addition, the availability of desalting units suitable for use by individual farms and homes was investigated. (OSW) W74-08066

HIGH TEMPERATURE ELECTRODIALYSIS, PHASE I,

Ionics, Inc., Watertown, Mass.

F. B. Leitz.

Available from the National Technical Information Service as PB-226 825/AS; \$4.00 in paper copy, \$1.45 in microfiche. Phase I thru III availaas PB-226 824-SET/AS, \$11.00. Saline Water, Report INT-OSW-RDPR-74-912, January 1974. 87 p, 16 fig, 23 tab. OSW Contract 14-01-0001-1158.

Descriptors: *Desalination, *Electrodialysis, *Ion transport, *Membrane processes, Membranes, Saline water, Brackish water, Plastics. Identifiers: Polystyrene, Hittorf transport num-

An investigation was made of the properties of organic ion-transfer membranes at room temperature and at temperatures approaching the normal boiling point of water. Five parameters were measured: electrical resistance, Hittorf transport number, electroosmotic water transport, water permeation and salt diffusion. The membranes evaluated were of crosslinked polystyrene which had been polymerized around a fibrous material in the presence of a soluble nonpolymerizing agent and subsequently chemically reacted to form fixed positive or negative sites. Standard (22 mil) commercial membranes and thin (4 to 6 mil) experimental membranes were evaluated. (See also W74-08068 thru W74-08070) (OSW)

HIGH TEMPERATURE ELECTRODIALYSIS, PHASE II,

Ionics, Inc., Watertown, Mass. F. B. Leitz, and H. I. Viklund.

Available from the National Technical Information Service as PB-226 826/AS; \$4.00 in paper copy, \$1.45 in microfiche. Office of Saline Water, Report INT-OSW-74-913, January 1974. 94 p, 19 fig, 20 tab, 3 ref. OSW Contract 14-01-0001-1158.

Descriptors: *Desalination, Desalination processes, *Electrodialysis, Membranes, Saline water, Sea water, *Ion transport, *Membrane process.

Identifiers: Polycarbonate, Polysulfone, Nylon, Hittorf transport numbers

The economic evaluation of high temperature electrodialysis showed a large parameter region in which high temperature operation would be substantially cheaper than source temperature opera-tion. This would be true in the case where the required number of stages is large or where cheap heat is available. Standard resins perhaps with a lower water content are suitable for high temperature application. Techniques and materials were developed for lamination of a high temperature thin spacer. The synthetic Webster, S.D., plant water used in this program did not present any particular hazards at high temperature compared to sodium chloride solutions or synthetic desalted sea water. (See also W74-08067) (OSW) W74-08068

HIGH TEMPERATURE ELECTRODIALYSIS. PHASE III.

PHASE III, Ionics, Inc., Watertown, Mass. F. B. Leitz, M. A. Accomazzo, and H. I. Viklund. Available from the National Technical Information Service as PB-226 827/AS; \$5.00 in paper copy, \$1.45 in microfiche. Office of Saline Water, Report INT-OSW-74-914, January 1974. 156 pages, 3 references, 29 tables, 42 figures. OSW Contract 14-01-0001-2322.

Descriptors: *Desalination, *Electrodialysis, Ion transport, *Membrane processes, Membranes, Saline water, Brackish water, *Design, Testing. Identifiers: Economic analysis.

The program covered the development and testing of a thin spacer (20 mil), which could be utilized with thin membranes (6 mil) in a high temperature (160 deg - 180 deg F) field test unit. Results indicated that a low cut per pass (20-30%) is desirable for good area utilization. Hence, for a thin spacer, this requires a fairly short flow path. The relationship between (CN/N)o and velocity plus the relationship between pressure drop and velocity were used to predict the performance of a unit as a function of total pressure drop. The Phase III report summarizes the following: (1) analytical studies, (2) experimental results from short term and long term tests. (3) design and testing of a thin spacer for utilization in high temperature electrodialysis, and (4) design of a field test unit. (See also W74-08067) (OSW) W74-08069

HIGH TEMPERATURE ELECTRODIALYSIS,

PHASE IV, Ionics, Inc., Watertown, Mass.

M. A. Accomazzo, F. B. Leitz, H. I. Viklund, and R. L. Sampson.

Available from the National Technical Information Service as PB-227 280/AS; \$6.50 in paper copy, \$1.45 in microfiche. Office of Saline Water, Report INT-OSW-73-915, November 1973. 70 p, 17 fig, 18 tab, 12 ref. OSW Contract 14-30-2963.

*Desalination, Descriptors: Desalination processes, *Electrodialysis, Pilot plants,
'Membrane processes, *Design, Testing, *Cost processes, comparisons Identifiers: Spacers.

The overall objective of this program is the development of improved electrodialysis technology. On previous contracts the effect and applicability of two process improvements: high temperature operation and use of thinner than standard components were determined. The technical and economic aspects of these developments are discussed. The present program has dealt with the design, fabrication, testing and specification of a means of manufacture of thin spacers and membranes for use at temperatures up to 80 deg C. Satisfactory means of manufacture were developed for both spacers and membranes. Design equations and empirical relationships for the new components are presented. Performance and economics are predicted for plants of 3780 cubic meters/day (1 MGD) and two lower capacities. An economic comparison is made between these plants and conventional plants in sea water service. These estimates indicate that in this capacity range, electrodialysis can be competitive with distillation for sea water desalting. (See also W74-08067) (OSW) W74-08070

3B. Water Yield Improvement

WATER RESOURCES OF LEHIGH COUNTY. PENNSYLVANIA, Geological Survey, Harrisburg, Pa.

For primary bibliographic entry see Field 4A.

DEFORMATION MODULI OF WATER-BEAR-ING FORMATIONS AT ELEVATED TEMPERA-

California Univ., Berkeley, Coll. of Engineering, For primary bibliographic entry see Field 4B. W74-07726

OPTIMUM DRILLING SITES FOR GROUND-WATER DEVELOPMENT ON THE EAST COAST OF LANAI ISLAND,

Hawaii Univ., Honolulu. Water Resources Research Center For primary bibliographic entry see Field 4B.

W74-07734

PHREATOPHYTES, A BIBLIOGRAPHY. REVISED.

Office of Water Resources Research, Washington, D.C

Available from the National Technical Informa-Available from the National Technical Information Service as PB-232 259, 86.75 in paper copy, \$1.45 in microfiche. Water Resources Scientific Information Center Report WRSIC 74-201, April 1974, 277 p. Edited by Patricia Paylore, University of Arizona, Tucson.

*Phreatophytes, *Bibliographies, Descriptors: *Xerophytes, *Evapotranspiration, Arid lands, *Chaparral, *Sagebrush, Soil moisture, *Tamarisk, Vegetation effects, Water yield improvement.
Identifiers: Brush control.

This report, containing 183 abstracts, is another in a series of planned bibliographies in water resources to be produced from the information base comprising SELECTED V RESOURCES ABSTRACTS (SWRA). WATER At the time of search for this bibliography, the data base had 68,063 abstracts covering SWRA through February 1974 (Volume 7, Number 4). Author and subject indexes are included. W74-07829

WATER IN THE OKANOGAN RIVER BASIN, WASHINGTON,

Geological Survey, Tacoma, Wash. K. L. Walters.

Washington State Department of Ecology, (Olympia), Water-supply Bulletin 34, 1974, 136 p, 35 fig, 1 plate, 8 tab.

Descriptors: *Water resources, *Washington, *Surface waters, *Groundwater, Water balance, Water utilization, Water yield, Water quality, Hydrologic data, Data collections. Identifiers: *Okanogan River Basin(Wash).

Water information is presented for use in developing, protecting, and managing the water resources of the Okanogan River basin of Washington. Based on records compiled from 1930 through 1969, the estimated mean annual precipitation over the study area is 17.5 inches. About 2.1 million acre-feet of water enters the study area each year from Canada as streamflow. Alluvial and glacial sedimentary deposits ranging from a few feet to several hundred feet thick contain the main volume of groundwater in the basin, with sand and gravel layers constituting the principal water-bear-ing zones. Most of the sedimentary deposits are underlain by poorly permeable bedrock. In some places, the sedimentary deposits are thick and consist almost entirely of sand and gravel contain-ing large quantities of groundwater. In other

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 3

Use Of Water Of Impaired Quality—Group 3C

places, the deposits are thin or impermeable, and hold little water. Streamflow accounts for most of hold little water. Streamliow accounts for most of the water leaving the basin. The discharge averaged about 2.2 million acre-feet per year in water years 1959-69. Evapotranspiration loss ex-ceeds the average annual precipitation for most ir-rigated crops. Water in the Okanogan and Similkameen Rivers is of the calcium-magnesium bicarbonate type, and is suitable for most common used. Some lakes contain water of about the same quality as the streams that feed them. However, the closed-basin lakes contain saline water. Groundwater generally is more mineralized and more variable in chemical composition than the surface water, but in the Okanogan River basin it still is suitable for most common uses. Most of the fertile land of the basin that can be readily supplied from surface-water sources is being irrigated. (Knapp-USGS) W74-07907

RECLAMATION RESEARCH IN THE SEVEN-

TIES--FIRST PROGRESS REPORT.
Bureau of Reclamation, Denver, Colo. For primary bibliographic entry see Field 4A. W74-07922

PROJECT SKYWATER 1972 ANNUAL RE-PORT.

Bureau of Reclamation, Denver, Colo, Office of Atmospheric Water Resources.

Available from NTIS, Springfield, Va. 22151, as REC-ERC-73-17, Price \$6.00 printed copy, \$1.45 microfiche. Bureau of Reclamation Engineering and Research Center Report 73-17, November 1973. 540 р.

Descriptors: *Weather modification, *Cloud seeding, Cloud physics, Model studies, Ecology, Instrumentation, Meteorology, Colorado basin, Columbia River. Identifiers: *Project Skywater.

The Bureau of Reclamation's precipitation management activities in fiscal year 1972 are sum-marized and advances made under the research program are discussed. The first part of the report outlines the project, its goals and depth. The second portion consists of reports prepared by the contractors who participated in Project Skywater during the fiscal year. The reports are preceded by descriptions which introduce the individual project, its USGS) its objective, progress and funding. (Knapp-W74-07928

SOME CLIMATOLOGICAL CHARAC-TERISTICS OF SEEDABLE UPSLOPE CLOUD SYSTEMS IN THE HIGH PLAINS,

National Oceanic and Atmospheric Administra-tion, Boulder, Colo. Environmental Research Labs

C. D. Whiteman. Technical Report 268-APCL 27, March 1973. 43 p, 32 fig. 3 tab, 6 ref, append.

Descriptors: *Meteorology, *Mathematical models, *Cloud seeding, Weather modification, Cloud physics, Winds, Climatology, Great Plains.

A model to describe seeding opportunity was developed for shallow wintertime cloud systems in the High Plains of the United States. The model uses rawinsonde network data for the High Plains to determine climatological characteristics of seedable upslope cloud systems. Included are annual, monthly, and diurnal frequencies of occurrence of seedable cloud systems as well as characteristics of the cloud systems themselves. Such characteristics include cloud thicknesses, heights of cloud tops and bases, lapse rates, cloud top temperatures, upslope wind components, and the relative frequencies of precipitating and precipitating cloud systems. (Knapp-USGS) W74-07929

3C. Use Of Water Of Impaired Quality

THE SIGNIFICANCE OF RAINFALL ON SALT AND SODIUM ACCUMULATIONS UNDER IR-RIGATION,

South Dakota State Univ., Brookings. Dept. of Plant Science.

Available NTIS as PB-232 165, microfiche \$1.45. South Dakota Water Resources Institute. Brookings, Completion Report, March 1974. 18 p. 1 fig, 6 tab. OWRR A-020-SDAK(1). 14-01-0001-1862.

Descriptors: *Irrigation effects, *Rainfall, Water quality standards, Salts, *Salinity, *Sodium, Sodium compounds, adsorption, Cations, Anions. Identifiers: Residual sodium carbonate, *Sodium adsorption ratio

Since irrigation water quality standards were established for use under arid conditions, it has been rationalized that they may be too stringent where natural precipitation may have a modifying effect on either or both of the sodium and salinity hazards. The rationalization was studied in a 17 inch rainfall belt using groundwaters with electrical conductivities of about 2000 micromhos per cm at 25C and having sodium adsorption ratio (SAR) values of about 10. The results determined from the field and plot experiments indicate that there is no justification for raising tolerable sodium adsorption ratio levels in irrigation water used in this rainfall belt; rather it showed that there may be reason for lowering them from three to four units.
(Wiersma-South Dakota State) W74-07743

LEACHING REQUIREMENT STUDIES: SEN-SITIVITY OF ALFALFA TO SALINITY OF IR-RIGATION AND DRAINAGE WATERS. Agricultural Research Service, Riverside. Salinity

L. Bernstein, and L. E. Francois. Soil Science Society of America Proceedings, Vol 37, No 6, p 931-943, November-December, 1973. 4 fig, 10 tab, 17 ref.

Descriptors: *Alfalfa, *Lysimeters, *Leaching, *Water quality control, Irrigation operation and management, Irrigation effects, Salt balance, Drainage water, Investigations, *Salts, Chlorides, Soil profiles, Water requirements.

Alfalfa was grown in 0.6 by 1.5 meter greenhouse lysimeters and irrigated with two waters of EC 1 and 2 mmho/cm prepared by adding equivalent amounts of NaCl and CaCl2 to a 0.4 mmho/cm tap water. Yields showed relatively little effect of leaching fraction (LF) within the limits consistent with steady-state salt balance for suction-drained lysimeters but decreased 26 percent at the lowest LF for gravity-drained lysimeters. Cessation of leaching or reduction of LF to levels requiring drainage water salinities for salt balance at steady state to exceed 35 mmho/cm eventually reduced yields. Yield response appears to be related to the calculated mean salinity against which water was absorbed, which is influenced more by the salinity of the irrigation water than by the salinity of the drainage water. LF in the broad range that permitted nearly maximum growth had essentially no effect on water requirement or on Na and Cl contents of the harvested alfalfa. Increasing irrigation water salinity in the range 0.4 to 2 mmho/cm consistently increased plant Na and Cl contents, but had no effect on water requirement. Implications of the demonstrated lower leaching requirements for irrigation management and drainage and for water quality assessment (Sandoski-Franklin) discussed. are

EFFECTS OF COLORADO RIVER WATER QUALITY AND SUPPLY ON IRRIGATED AGRICULTURE, Economic Research Service, Davis, Calif.

C. V. Moore, H. H. Snyder, and P. Sun. Water Resources Research, Vol 10, No 2, p 137-144, April 1974. 7 fig. 2 tab. 4 equ. 8 ref.

Descriptors: *Irrigation water, *Water supply, Saline water, "Water quality, Agriculture, Estimating, Linear programming, Regional analysis, Water demand, Irrigated land, Optimization, Colorado River, Farms, Size, Soils, Prices, Water rates, Mathematical models, Systems analysis, *California.
Identifiers: *Imperial Valley(Calif.), *Crop yield,

Demand elasticity, Cost structure, Electroconductivity, Demand schedule.

Considered are salination effects upon irrigation water supplies in the Imperial Valley of California.

A production function relating irrigated crop yield to the quality and supply of irrigation water is developed. The objective function is to maximize the return to land and water. Described is a linear programming, farm model constructed to estimate the probable effects of various levels of supply and quality. A regional programming model, an aggregation of three different size individual farms, reflects the distribution of soils and the cost structure representative of farm size. Given the production function, cropping pattern and irrigation management can be optimized using the linear programming models. Use of the regional model for estimating the demand schedule for irrigation water is discussed. Results show that the adverse effects of saline irrigation water can be offset by applying additional water over and above that required for plant transpiration. A degradation of the water supply in the Colorado River at Imperial Dam from the existing level of electroconductivity to the projected level for the year 2000 would cause a decline in the return to land and water of about 14%. Because of the relatively elastic demand for irrigation water at the current price, any attempt to ration water through a market price mechanism would have no effect, unless water rates were about double their current levels. (Bell-Cornell) W74-08014

INFLUENCE OF TEMPERATURE AND MOISTURE STRESS FROM SODIUM CHLORIDE SALINIZATION ON OKRA EMER-GENCE.

Florida Univ., Dover. Agricultural Research Center

E. E. Albregts, and C. M. Howard. Agronomy Journal, Vol 65, No 5, p 836-837, September-October, 1973, 1 tab. 7 ref.

Descriptors: *Soil moisture. *Stress. *Salinity. Crop response, Crop production. Identifiers: *Okra.

Okra seed were planted in a Scranton fine sand soil at 20, 25, and 30 C with six levels of moisture stress, 1.18, 1.75, 2.41, 4.33, 5.90, and 10.84 atm. Moisture stress was obtained by varying the moisture level in the soil and by NaCl salinization. The emergence rate and fresh plant weight decreased as the temperature decreased and soil moisture stress increased. The optimum temperature and soil moisture stress for total and earliness of emergence was 25 to 30 C and 1.18 atm. No emergence occurred at 10.84 atm of moisture stress and total emergence was reduced only at 5.90 atm and 20 C. (Skogerboe-Colorado State) W74-08073

TOLERANCE OF RICE (ORYZA SATIVA L.) TO SALT DURING BOOT, FLOWERING, AND GRAIN-FILLING STAGES,

Agricultural Research Service, Brawley, Calif. Imperial Valley Conservation Research Center.
M. T. Kaddah, W. F. Lehman, and F. E. Robinson.

Field 3-WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3C-Use Of Water Of Impaired Quality

Agronomy Journal, Vol 65, No 5, p 845-847, September-October, 1973. 1 fig, 14 ref.

Descriptors: *Salinity, *Crop response, *Rice, Soil moisture, Stress, *Crop production.

The effect of soil salinity on rice development at the boot, flowering, and grain-filling stages was tested for three varieties transplanted in a greenhouse. The irrigation waters used had electrical conductivities of 1.4, 3.0, and 6.0 mmho/cm at 25C. The last two irrigation waters were introduced at the three stages of development and used until harvest. Weights of grain and straw and lengths of plants and panicles did not differ signifi-cantly between the treatments, indicating that rice is not sensitive to salt after the boot stage. (Skogerboe-Colorado State) W74-08080

EFFECTS OF DRAINAGE AND ORGANIC AMENDMENTS ON THE RECLAMATION OF A SODIC SOIL CROPPED WITH RICE,

California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering. B. S. Puttaswamygowda, E. F. Wallihan, and P. F.

Pratt

Soil Science Society of America Proceedings, Vol 37, No 4, p 621-625, July-August, 1973. 6 fig, 3 tab,

Descriptors: *Salinity, *Sodium, *Alkaline soils, Soil chemistry, Organic matter, *Drainage, Soil physics, *Rice, Crop response.

In a greenhouse not culture study effects of drainage and organic amendments on the reclamation of a saline sodic soil material under submerged conditions were studied with and without the presence of a rice crip. In drained soils, application of dairy manure, sugar, straw or straw + CaC12 increased the rate of drainage and decreased the electric conductivity and exchangeable sodium percentage. Without drainage, treatments were less effective. Crop growth hastened the reclamation process by increasing the volume of water drained and the concentration of Ca + Mg in the drainage water. Drainage had a significant effect on the vegetative growth of rice, percentage of earbearing tillers, and straw and grain In the undrained condition, organic soil amendments, except dairy manure, adversely af-fected the straw and grain yield. (Skogerboe-Colorado State) W74-08087

RELATIONSHIP BETWEEN SOIL OXYGEN DIFFUSION RATE AND YIELD OF OATS IN A COASTAL ALLUVIAL SOIL AT CRITICAL SALINITY LEVEL,

Department of Agriculture, Frederiction (New Brunswick). Research Station.

G. R. Saini Agronomy Journal, Vol 65, No 5, p 841-842, September-October, 1973. I fig. 1 tab, 7 ref.

Descriptors: *Salinity, *Oxygenation, Root dis-tribution, Root zone, Root development, *Oats, Crop production, Alluvium, Soil physical proper-

Identifiers: Oxygen diffusion rate.

The effect of improved soil physical conditions, as characterized by oxygen diffusion rate (ODR), on the growth of oats at the critical soil salinity level (ECe = 5.0 mmhos cm-1) is reported. In a coastal alluvial soil at critical salinity level, the yield of oats increased from 0.55 g/pot to 10.88 g/pot as ODR increased from 7.3 x 10 to the minus 8th power grams per cm squared per minute to 31.0 x 10 to the minus 8th power grams per cm squared per minute. The root elongation of the plant also appeared to be related to ODR. (Skogerboe-Colorado State) W74-08094

3D. Conservation In Domestic and Municipal Use

PRECIPITATION CHARACTERISTICS OF THE NORTHERN NEW JERSEY, NEW YORK CITY METROPOLITAN AREA, Rutgers-The State Univ., New Brunswick, N.J.

For primary bibliographic entry see Field 2B. W74-07607

INNOVATION: A CASE STUDY. American Society of Civil Engineers, New York. For primary bibliographic entry see Field 6B.

STREAMFLOW MODEL METROPOLITAN PLANNING AND DESIGN, Metropolitan Sanitary District of Greater Chicago,

For primary bibliographic entry see Field 2A.

WATER RESOURCES MANAGEMENT FOR METROPOLITAN WASHINGTON: ANALYSIS OF THE JOINT INTERACTIONS OF WATER AND SEWAGE SERVICE, PUBLIC POLICY AND LAND DEVELOPMENT PATTERNS IN AN EXPANDING METROPOLITAN AREA. Metropolitan Washington Council of Governments, D.C.

For primary bibliographic entry see Field 6B. W74-07723

APPENDICES TO WATER RESOURCES MANAGEMENT FOR METROPOLITAN WASHINGTON: ANALYSIS OF THE JOINT IN-TERACTIONS OF WATER AND SEWAGE SER-VICE, PUBLIC POLICY, AND LAND DEVELOPMENT PATTERNS IN AN EXPAND-ING METROPOLITAN AREA. Metropolitan Washington Council of Govern-

For primary bibliographic entry see Field 6B.

W74-07724

MUNICIPAL AND INDUSTRIAL WATER Kansas Univ., Lawrence. Dept. of Civil Engineer-

For primary bibliographic entry see Field 6D. W74-07968

REGIONAL ENERGY-WATER PROBLEMS, SOUTHERN PLAINS,

Texas A and M Univ., College Station. Water Resources Inst. For primary bibliographic entry see Field 6D. W74-07976

OPTIMAL TIMING AND SIZING OF A CON-JUNCTIVE URBAN WATER SUPPLY AND WASTE WATER SYSTEM WITH NONLINEAR

PROGRAMMING, Loyola Univ., Los Angeles, Calif. For primary bibliographic entry see Field 5D. W74-08010

IMPROVING MUNICIPAL WATER SUPPLIES IN ARIZONA BY DESALTING, Arizona Water Commission, Phoenix.

For primary bibliographic entry see Field 3A. W74-08063

POTENTIAL CONTRIBUTION OF DESALTING SYSTEFS TO MUNICIPAL WATER QUALITY AND SUPPLY IN SOUTH DAKOTA. Banner (J.T.) and Associates, Inc., Brookings, S. For primary bibliographic entry see Field 3A.

3E. Conservation In Industry

REVERSE OSMOSIS PROCESS AND ITS APPLICATION, (IN JAPANESE), For primary bibliographic entry see Field 5D. W74-07750

TRITIUM DISTRIBUTION IN THE NUCLEAR INDUSTRY - THE REQUIREMENTS FOR CON-TROL STRATEGIES,

Allied Chemical Corp., Idaho Falls, Idaho. Idaho Chemical Programs Operations Office. For primary bibliographic entry see Field 5B. W74-07784

SOCIAL AND ECONOMIC FACTORS IN THE ADOPTION BY INDUSTRY OF WATER POL-LUTION CONTROL MEASURES IN MIN-NESOTA.

Minnesota Univ., St. Paul. Inst. of Agriculture. For primary bibliographic entry see Field 5G.

PREVENTION OF CALCIUM CARBONATE SCALE DEPOSITION IN MILL WATER

NL Industries, Inc., Houston, Tex. Baroid Div. For primary bibliographic entry see Field 8G.

SUN OIL DEVELOPS WATER REUSE PRO-GRAM.

Sun Oil Co., Toledo, Ohio. For primary bibliographic entry see Field 5D. W74-07882

CORROSION BY WATERS, Union Carbide Corp., New York. For primary bibliographic entry see Field 8G. W74-07890

PROCESSES, PROCEDURES, AND METHODS TO CONTROL POLLUTION FROM MINING ACTIVITIES.

Skelly and Loy, Harrisburg, Pa. For primary bibliographic entry see Field 5G. W74-07927

THE HYDROGEOLOGY AND UTILIZATION OF BRINES IN EL SALADO, CHILE, Birmingham Univ. (England). Dept. of Geology. For primary bibliographic entry see Field 4A. W74-07936

THE ROLE OF WATER IN THE ENERGY CRI-

Nebraska Univ., Lincoln. Water Resources Research Inst. For primary bibliographic entry see Field 6D. W74-07961

THE ROLE OF WATER IN THE ENERGY CRI-

Water Resources Council, Washington, D.C. For primary bibliographic entry see Field 6D. W74-07962

MUNICIPAL AND INDUSTRIAL WATER

Kansas Univ., Lawrence. Dept. of Civil Engineer-For primary bibliographic entry see Field 6D. W74-07968

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 3

Conservation In Agriculture—Group 3F

REGIONAL ENERGY-WATER PROBLEMS. MISSOURI RIVER. North Dakota State Univ., Fargo. Water

Resources Research Inst. For primary bibliographic entry see Field 6D.

REGIONAL ENERGY-WATER PROBLEMS, SOUTHERN PLAINS, Texas A and M Univ., College Station. Water

Resources Inst.
For primary bibliographic entry see Field 6D.
W74-07976

REGIONAL ENERGY-WATER PROBLEMS--COLORADO RIVER-GREAT BASIN, Colorado State Univ., Fort Collins. Environmental

Resources Center. For primary bibliographic entry see Field 6D. W74-07977

INDUSTRIAL APPLICATION OF WHITFORD'S DEMAND FORECASTING PROCEDURE, Southern Methodist Univ., Dallas, Tex. Inst. of Tech.

For primary bibliographic entry see Field 6D. W74-08015

THE POTENTIAL OF DESALTING FOR INDUS-TRIAL WATER SUPPLIES IN NORTHEAST-ERN WYOMING, For primary bibliographic entry see Field 3A.

3F. Conservation In Agriculture

IRRIGATION OF CITRUS WITH CITRUS WASTE WATER, Florida Univ., Lake Alfred. Inst. of Food and

Agricultural Sciences. For primary bibliographic entry see Field 5D. W74-07603

ECONOMIC OPTIMIZATION AND SIMULA-TION TECHNIQUES FOR MANAGEMENT OF REGIONAL WATER RESOURCE SYSTEMS, Texas Water Development Board, Austin. For primary bibliographic entry see Field 6A. W74-07714

ECONOMIC EVALUATION OF THE EFFECT OF SELECTED CROP PRACTICES ON NONAGRICULTURAL USES OF WATER, Illinois Univ., Urbana. Dept. of Agricultural Economics.

For primary bibliographic entry see Field 5B.

AUTOMATIC PUMPING INSTALLATIONS FOR LIVESTOCK SECTIONS, For primary bibliographic entry see Field 8C. W74-07864

SOUTH DAKOTA STANDARDS FOR IRRIGA-TION PUMPS AND POWER UNITS, South Dakota State Univ., Brookings. Inst. of Ir-

rigation Technology.
For primary bibliographic entry see Field 8C. W74-07895

SOUTH DAKOTA STANDARDS FOR CON-STRUCTION OF IRRIGATION WELLS IN SHALLOW UNCONSOLIDATED GLACIAL

SEDIMENTS. South Dakota State Univ., Brookings. Inst. of Irrigation Technology. For primary bibliographic entry see Field 8A. W74-07896

IRRIGATION WELL CONSTRUCTION. South Dakota State Univ., Brookings, Inst. of Irrigation Technology.

For primary bibliographic entry see Field 8A.

METHODS AND PRACTICES FOR CONTROLLING WATER POLLUTION FROM AGRICULTURAL NONPOINT SOURCES. For primary bibliographic entry see Field 5B. W74-07941

ENVIRONMENTAL ASPECTS OF ENERGY-WATER RELATIONSHIPS,
Nebraska Univ., Lincoln. Dept. of Agricultural

Economics. For primary bibliographic entry see Field 6D. W74-07965

AGRICULTURAL WATER SUPPLY, Nebraska Univ., North Platte. Dept. of Agricultural Engineering. For primary bibliographic entry see Field 6D. W74-07969

A SYSTEMS APPROACH TO ASSESSMENT OF RURAL WATER SUPPLY PROGRAM EFFEC-

Asian Inst. of Tech., Bangkok (Thailand). Dept. of Environmental Engineering. For primary bibliographic entry see Field 6B. W74-08012

PROBLEM OF ASSESSING EFFECTS OF PROBLEM OF ASSESSING EFFECTS OF HUMAN ACTIVITY ON SURFACE-WATER RESOURCES (K PROBLEME OTSENKI VLIYANIYA DEYATEL'NOSTI CHELOVEKA NA RESURSY POVERKHNOSTNYKH VOD), Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 4A.
W74-08053

OPTIMAL CONJUNCTIVE USE MODEL FOR

INDUS BASIN, Colorado State Univ., Fort Collins. Dept. of Civil Engineering. For primary bibliographic entry see Field 4B. W74-08059

EFFECT OF TEMPERATURE AND PLANT WATER STRESS ON PHOTOSYNTHESIS DIF-FUSION RESISTANCE, AND LEAF WATER POTENTIAL IN SPRING WHEAT,

Agricultural Research Service, Mandan, N.Dak. Northern Great Plains Research Center. A. B. Frank, J. F. Power, and W. O. Willis. Agronomy Journal, Vol 65, No 5, p 777-780, September-October, 1973. 4 fig, 3 tab, 19 ref.

Descriptors: *Soil moisture, *Crop response, *Wheat, Stress, Soil-water-plant relationships, Droughts, Salinity, *Photosynthesis, Droughts, Temperature.

A study was conducted in growth chambers to determine the combined effects of temperature and soil water supply on the development of plant water stress and subsequent recovery in spring wheat. Measurements were made of leaf water potential, photosynthesis, and stomatal diffusion resistance on the fifth leaf at tillering and the flag leaf at heading, flowering, and grain-filling growth stages for plants grown at 10, 18, and 27C. Stostages for plants grown at 10, 18, and 27C. Sto-matal closure of stressed plants was affected by both leaf position and age. Closure occurred at -13, -13, and -15 bars leaf water potential at tillering and at -18, -17, and -26 bars at heading for 10, 18, and 27C, respectively. As the flag leaf matured, stomata closed at progressively lower leaf water potential. In nonstressed check plants, temperature greatly influenced leaf water potentials. (Skogerboe-Colorado State) W74-08075

EFFECT OF ESTABLISHMENT METHOD, VARIETY, AND SEEDING RATE ON THE PRODUCTION AND QUALITY OF ALFALFA UNDER DRYLAND AND IRRIGATION,

South Dakota State Univ., Brookings. Dept. of Plant Science

L. H. Hansen, and C. R. Krueger. Agronomy Journal, Vol 65, No 5, p 755-759, September-October, 1973. 1 fig, 3 tab, 10 ref.

Descriptors: *Alfalfa, *Planting management, *Crop response, Management, Irrigation, Dry farming, *Crop production.

This study was designed to compare alternative establishment methods and determine the influence of alfalfa varieties and seeding rates on dry matter and crude protein production and herbage quality. The relationship between alfalfa plant density and root+crown weight and their effect on forage yield were evaluated. Pure stands of alfalfa were established by four methods: (1) no herbicide or companion crop (check); (2) a pre-plant herbi-cide, S-ethyl dipropylthiocarbamate (EPTC); (3) a companion crop of oats harvested for forage; and (4) a companion crop of oats harvested for grain. Three alfalfa varieties were evaluated: T3X-8 hybrid, 'Saranac,' and 'Vernal.' Four alfalfa seeding rates were compared: 4.5, 9.0, 13.5, and 17.9 kg/ha of pure-live-seed. Studies were conducted at three locations in South Dakota. Experiments at Gayville and Norbeck were under dryland conditions and at Brookings under irrigation. (Skogerboe-Colorado State) W74-08077

EFFECT OF NARROW TRENCHING IN HARLINGEN CLAY SOIL ON PLANT GROWTH, ROOTING DEPTH, AND SALINITY, Agricultural Research Service, Weslaco, Tex. Soil and Water Conservation Research Div. M. D. Heilman, and C. L. Gonzalez.

Agronomy Journal, Vol 65, No 5, p 816-819, September-October, 1973. 5 fig, 4 tab, 12 ref.

Descriptors: *Soil texture, *Salinity, *Crop response, Cultivation, *Cotton, Root zone, Root distribution, *Clays.

Narrow, backfilled trenches (61 and 102 cm deep) were tested in a Harlingen clay soil as a management technique to increase rooting depth and volume of soil available to roots. Cotton was planted directly over the trenches each year for 3 years. Cotton yields were significantly increased by trenching during 1971 and 1972. Yields of 815, 995, 1163, and 1018 kg/ha were obtained during 1972 for check, 61-cm trench soil-backfilled, 61-cm trench, soil-vermiculite backfilled, and 102-cm trench soil-backfilled, respectively. Root penetra-tion and distribution was increased from 60 cm for conventional tillage to 122 cm for 102-cm deep trenches. An average of 83% of roots for conventional tillage were in surface 30 cm as compared with 43% of 102-cm trench. Trenching increased water infiltration rates, decreased soil bulk density in trenches, and increased soil root volume available to plants. (Skogerboe-Colorado State)
W74-08078

SUGARBEET RESPONSE TO IRRIGATION AS MEASURED WITH GROWTH SENSORS, Southwestern Great Plains Research Center,

Bushland, Tex. W. C. Johnson, and R. G. Davis.

Agronomy Journal, Vol 65, No 5, p 789-794, September-October, 1973, 7 fig. 5 ref.

Descriptors: *Soil moisture, *Crop response, *Sugar beets, Irrigation, Irrigation practices, Growth rates.

Field 3-WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3F-Conservation In Agriculture

The continuous growth records of two typical irrigated sugarbeet roots were compared at Bushland, Texas, during a 48-day period, June 25 to August 11, 1970, in a record dry season when there was little interference from rainfall on the effect of irrigation on root growth. The roots received 10 cm of irrigation water on staggered dates so that the growth record of a root not being irrigated at a particular time might be used to interpret the growth response to irrigation of the second root. The soil was slowly permeable, requiring an average of about 3 days for free water to disappear after an irrigation. A slow-growth period of about 3 days in length occurred after each irrigation during which time the irrigated root grew more slowly than the unirrigated root. When moisture stress was not extreme at the time of irrigation, a temporary decrease in growth rate actually occurred after irrigation. (Skogerboe-Colorado State) W74-08079

RECOVERY, RESIDUAL EFFECTS, AND FATE OF NITROGEN FERTILIZER SOURCES IN A SEMIARID REGION.

Agricultural Research Service, Mandan, N. Dak. Northern Great Plains Research Center. For primary bibliographic entry see Field 5B. W74-08086

FLOOD AND SEEPAGE WATER SAMPLING TECHNIQUES IN RICE FIELDS UNDER DIF-WATER MANAGEMENT PRAC-FERENT TICES.

California Univ., Davis. Dept. of Water Science and Engineering.
For primary bibliographic entry see Field 5B.

W74-08090

VARIATIONS IN POTASSIUM CONTENT OF ALFALFA GROWN ON PSEUDOGLEY SOIL DEPENDING ON MINERAL FERTILIZING, (IN SERBO-CREATION),

Zagreb Univ. (Yugoslavia). Zavod Opcu Proiz-

A. Butorac

Poljopr Znan Smotra. 27. p 59-68, 1971. (English

identifiers: *Alfalfa, Calcium, *Fertilization,
*minerals, Nutrients, *Potassium, *Pseudogley Identifiers: soil, Soil moisture, Absorption.

The K content in alfalfa is primarily influenced by K fertilizing and by the quantities of K available in the soil. The uptake of K depends also on soil moisture, and accordingly, on climatic charac-teristics, hence the secondary occurrence of con-siderable aberrations in certain cuttings. K fertilizing, in view of its accumulation in alfalfa, should be applied in accordance with the plant needs and stability of production. An excessive concentra-tion of K is possible which, due to its antagonism to Ca, may lower the nutritive value of alfalfa. The removal of K from the soil in alfalfa yields, especially in case of luxury consumption, is high .--Copyright 1973, Biological Abstracts, Inc. W74-08097

WAYS OF INCREASING THE PRODUCTION OF TAKYR SOILS OF THE TEDZHEN DELTA, (IN RUSSIAN),

O. M. Dzhumaev, O. G. Eshchekov, and K. N. Skosyreva.

Probl Osvoeniya Pustyn'. 1. p 53-57, 1973. (English summary).

Identifiers: *Cotton, Delta, *Fertilizers, Nitrogen, Phosphorus, Potassium, Soils, *Takyr soils, *USSR(Tedyhen delta), Desalination, Crop

With the desalination of the aeration zone, selection of appropriate crops, are the application of the necessary nutrients under optimal water conditions, high yields of cotton can be obtained. Application of 150-200 kg/ha of N, 100 kg of P and 45 kg of K2O to takyr soils provides maximum yield of raw-cotton .-- Copyright 1973, Biological Abstracts, W74-08098

EFFECTIVENESS OF MINERAL FERTILIZERS DURING COTTON CULTIVATING DEPEND-ING ON SOIL HUMIDITY, (IN AZERBAIJANI-

AN), R. K. Guseinov, and G. A. Mamedov. Dokl Akad Nauk Az SSR. Vol 28, No 5, p 74-78,

Descriptors: *Cotton, Cultivation, *Fertilizers, *Minerals, *Soil humidity, Crop production.

A positive effect of mineral fertilizers on the growth, development and accumulation of dry matter and productivity of cotton is marked by soil moisture 65-70% of field capacity.--Copyright 1973, Biological Abstracts, Inc. W74-08099

AMELIORATIVE EFFECT OF FIELD SHELTERBELTS UNDER CONDITIONS IN THE URALS, (IN RUSSIAN), For primary bibliographic entry see Field 4A. W74-08100

CORRELATIONS BETWEEN P, FE AND MN AVAILABILITY IN WATER-LOGGED SOIL AT DIFFERENT FERTILITY LEVELS,

Uttar Pradesh Inst. of Agricultural Sciences, Kan-pur (India). Div. of Soils and Agricultural Chemis-

For primary bibliographic entry see Field 2G. W74-08134

'HILL-TOP IRRIGATION,' A NEW SYSTEM FOR EARLY SWEETPOTATO PLANTING, (IN

SPANISH), Universidad Nacional de Tucuman (Argentina). Facultad de Agronomia y Zootecnica. F. Folquer, L. R. Roncedo, and E. R. Rossi. Rev Agron Noroeste Argent. Vol 9, No 1, p 145-164. 1972. Illus. English summary. Identifiers: *Irrigation practices, Soils,

on practices,
*Crop Sweetpotato, production, *Argentina(Tucuman).

Water distribution occurred along a small furrow made on top of the ridges, and it is called top irrigation. Low water requirement, (80,000 l/ha/irrigation) was observed. This system prevented soil compaction of the ridges, in conprevented soil compaction of the nages, in con-trast with usual irrigation methods. High yields (52,000 kg/ha) were obtained in both trials. Early planting was possible, even in lower rainfall periods. This top irrigation system was applicable during the first 2 mo. of plant growth. The limit in the top irrigation period under the conditions of Tucuman (Argentina) coincided with the initiation of the rainy season.--Copyright 1973, Biological Abstracts, Inc. W74-08136

STUDIES ON THE INFLUENCE OF IRRIGA-TION AND DIFFERENT DOSES OF N, P AND K ON THE FLOWERING BEHAVIOUR AND AB-SORPTION OF NUTRIENT ELEMENTS IN MUSKMELON (CUCUMIS MELO L.), Punjab Agricultural Univ., Ludhiana (India). Dept.

of Horticulture.

N. S. Jassal, K. S. Nandpuri, and K. S. Randhawa J Res Punjab Agric Univ. Vol 9, No 2, p 242-247.

Identifiers: Absorption, Cucumis-Melo, Doses, *Irrigation, *Muskmelon, *Nitrogen, Nutrients, *Phosphorus, *Potassium, *Fertilization.

The treatments consisted of 2 irrigation intervals, i.e., 1 wk (I1) and 2 wk (I2) and the levels of fertil-

izers were N at 0, 55, 110 and 165, P and K each at 0 and 55 kg/ha. The highest number of flowers was obtained with I2 and with the maximum dose of N at 165 kg/ha and the lowest with I1, with no N. Treatments of N 165 and 110 produced the maximum percentage of female flowers. The applica-tion of N 165 and P 55 significantly increased the total number of flowers as well as the percentage of female flowers and was followed by the applica-tion of N 110 K 55. The interaction effects of P and tion of N 110 K 35. The interaction effects of P and K were not significant. The percentage of N in plant tissue varied from 1.51 (where no fertilizer was added) to 2.93 where N, P and K were added at the rates of 165, 55 and 55 kg/ha, respectively.--Copyright 1973, Biological Abstracts, Inc. W74-08144

DROUGHT HARDENING IN ONIONS: I. IN-FLUENCE OF PRESOWING TREATMENTS ON VEGETATIVE BEHAVIOR AND YIELD, (IN

SPANISH), Universidad Nacional de Cuvo. (Argentina). Instituto de Biologia Vegetal. B. R. De Lis, J. Vega, and J. B. Cavagnaro.

Phyton Rev Int Bot Exp. Vol 301 No 1/2, p 77-88. 1972, Illus. (English summary). Identifiers: Allium-Cepa, Ammonium, Chlorides,

Chloroethyltrimethyl, *Drought resistance(Plants), Growth, Leaf, *Onions, Presowing treatment, Vegetation, *Crop produc-

The effect of presowing treatments on the onion plant (Allium cepa L., cv. Valenciana Sintetica No. 1) related to drought hardening at the critical period of water need was studied. Treatments were: distilled water; boric acid, 200 ppm; CCC 2-chloroethyl trimethylammonium chloride 2000 ppm; control. There is a critical period of water requirement at the beginning of bulb formation, and the presowing treatment with water effectiveand the presoning treatment with water effective-ly induced drought hardening at such period. Drought applied on the control and boric acid treatment caused a significant decrease (35%) in yield, with the CCC and water treatments were not affected, as compared with the control without drought. Moreover, presowing treatment with water, when submitted to drought, yielded 50% more than the control with drought. It was the only treatment that fulfilled the 2 requirements for hardening: it yielded as much as the control without drought, and it yielded significantly more than the control with drought. Growth of the plants showed that the immediate effect of water stress was to decrease the number of leaves (recovered later), while the bulb diameter and fresh weight decreased afterwards. At harvest time the bulbs from plants subjected to drought had a lower fresh weight. Since the leaves that ap-pear after the drought period are responsible for bulb growth, it was inferred that their ability to furnish their assimilates to the bulb was impaired. The presowing treatment with water produces on the leaves of the onion plant a qualitative change which counteracts the detrimental effect of drought on bulb growth. (See also W74-08149)--Copyright 1973, Biological Abstracts, Inc.

DROUGHT HARDENING IN ONIONS: II. ANALYSIS OF GROWTH, (IN SPANISH), Universidad National de Cuyo, Mendoza (Argentia). Instituto de Biologia Vegetal. J. Vega, B. R. De Lis, and J. B. Cavagnaro. Phyton Rev Int Bot Exp. Vol 30, No 1/2, p 89-107. 1972, Illus. (English summary). 1972; inus. (Egissi sulmary).
Identifiers: Allium-Cepa, Ammonium, Chloride, Chloroethyltrimethyl, *Drought resistance(Plants), *Growth onion plants, Leaf, *Onions, Reduced, Stress, Water, Weight.

After water stress, the absolute dry weight of leaves and bulb of the onion plant (Allium cepa L.) decreased. During the drought period, RGR relative growth rate, RLwGR relative weight growth rate, NAR net assimilation rate and the number of

WATER QUANTITY MANAGEMENT AND CONTROL-Field 4

Control Of Water On The Surface—Group 4A

leaves decreased significantly; but this effect disappeared later on. Leaf area was never affected by drought; but the changes in SLA specific leaf area showed, at the end of the drought period, that leaves contained less dry weight on a leaf area basis. The increase in LAR leaf area ratio calculated for the same period indicated that the whole plant had less dry weight on a leaf area basis. NAR of the bulb was reduced after the water stress. The lower yield was accounted for by a decreased growth of the photosynthetic system. Drought produced an irreversible damage on leaves which produced an irreversible damage on leaves which prevented them to finish their growth before the bulb's grand period of growth was initiated. The data of dry weight, leaf number, leaf area and growth rate indices concerning the hardening treatments showed that 8 wk after drought the presowing treatment with CCC 2, chloroethyl trimethylammonium chloride showed the best behavior. At the prepayers the ground this was reasonable. behavior. At the preharvest period this was no longer maintained. It was the presowing treatment with water which nullified the detrimental effects of drought on yield. (See also W74-08148)--Copyright 1973, Biological Abstracts, Inc. W74-08149

4. WATER QUANTITY MANAGEMENT AND CONTROL

4A. Control Of Water On The Surface

SUMMARY REPORT FOR A METHODOLOGY STUDY TO DEVELOP EVALUATION CRITERIA FOR WILD AND SCENIC RIVERS, Idaho Univ., Moscow. Dept. of Agricultural Economics. For primary bibliographic entry see Field 6B. W74-07608

AN ANALYTICAL INTERDISCIPLINARY EVALUATION OF THE UTILIZATION OF THE WATER RESOURCES OF THE RIO GRANDE IN NEW MEXICO: LOWER RIO GRANDE RE-GION, New Mexico State Univ., Las Cruces. Dept. of

Agricultural Economics. For primary bibliographic entry see Field 6B. W74-07609

GEOLOGY AND GROUNDWATER RESOURCES OF THE HANGMAN CREEK DRAINAGE BASIN, IDAHO-WASHINGTON, Washington State Univ., Pullman. Dept. of Geolo-

Northwest Geology, Vol 3, p 16-21, 1974. 1 fig, 2 tab. 9 ref.

Descriptors: *Water resources, *Hydrogeology, *Idaho, Groundwater, Surface waters, Water balance, Hydrologic budget. Identifiers: *Hangman Creek(Idaho).

Surface water and groundwater resources of Hangman Basin, Idaho were estimated by using Hangman Basin, Idaho were estimated by using empirical equations. The estimated average annual water supply is about 76,500 acre-feet of surface water and about 29,820 acre-feet of groundwater. About 2.5% of the total available groundwater resources are presently applied to domestic, stock, and irrigation uses in the basin. (KNapp-USGS) W74-07644

HISTORIC FLOOD INFORMATION FOR NORTHERN CALIFORNIA STREAMS FROM GEOLOGICAL AND BOTANICAL EVIDENCE, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 2E.

WATER RESOURCES OF LEHIGH COUNTY,

PENNSYLVANIA, Geological Survey, Harrisburg, Pa. C. R. Wood, H. N. Flippo, Jr., J. B. Lescinsky,

and J. L. Barker.

Pennsylvania Geological Survey, 4th Series,
Water Resource Report 31, 1972. 263 p, 47 fig, 5
plate, 49 tab, 83 ref.

Descriptors: *Water resources, *Surface waters, *Pennsylvania, *Groundwater, *Pennsylvania, Streamflow, Hydrogeology, Hydrologic data, Water yield, Water quality Identifiers: Lehigh County(Penn).

A study of Lehigh County, Pennsylvania, was made to determine how much water is available for man's use from streams and from the ground; the natural quality of this water and how man has affected its quality; how the relationships between streamflow and groundwater influence recrea-tional use of the streams; and how flooding limits man's use of the land. Much of the county drains to the Lehigh River, both directly and by way of tributary streams. About 40% of the 58 million gallons of water used per day in Lehigh County in 1966 was surface water, and the remainder was groundwater. Pumpage of the Friedensville Mine and other activities of man have reduced the flow of Saucon Creek at Lanark. Most of the change in flow took place from 1955 through 1958. After 1958, the flow of Little Lehigh Creek near Allentown was 25% less than in the 1946-58 period. The frequent dryness above the confluence with frequent dryness above the confluence with Swabia Creek reflects an increase in channel seepage that was apparently caused by a change that took place within the aquifers of the Little Lehigh Creek basin in 1959. The cause of the change is unknown, but was probably due to increases in permeability in the carbonate rock aquifers underlying the basin resulting from the removal of debris from one or more major fractures. Most of the surface water used by industry. tures. Most of the surface water used by industry in Lehigh County comes from the Lehigh River, and most of the surface water used for public supply comes from Little Lehigh Creek. With few exceptions, conventional treatment makes stream waters suitable for public supply and most industrial uses. Most groundwater occurs along joints, faults, and bedding planes. Most wells obtain water from several yielding zones. The number of yielding zones present in rocks decreases with depth. In the carbonate rocks, about 60 percent of the water-bearing zones in the upper 1,000 feet of rock occur within 350 feet of the land surface. Large quantities of ground water are available for industrial and public-supply use; at least 150 mgd could be pumped continuously from wells in Lehigh County. (Knapp-USGS) W74-07649

ESTIMATING THE MAGNITUDE OF PEAK DISCHARGES FOR SELECTED FLOOD FREQUENCIES ON SMALL STREAMS IN EAST

Geological Survey, Austin, Tex. For primary bibliographic entry see Field 2E. W74-07664

GEOLOGY AND WATER RESOURCES OF THE WHARTON TRACT AND THE MULLICA RIVER BASIN IN SOUTHERN NEW JERSEY, Resources Div. For primary bibliographic entry see Field 4B. W74-07668 Geological Survey, Trenton, N. J. Water

DRAINAGE AREA AND RIVER MILEAGE OF NEBRASKA STREAMS: PART 1-SALT AND WEEPING WATER CREEKS, BIG AND LITTLE NEMAHA RIVERS, AND MINOR STREAMS IN SOUTHEASTERN NEBRASKA,

Geological Survey, Lincoln, Nebr. For primary bibliographic entry see Field 2E.

WATER RESOURCES OF THE LITTLE RIVER

MAILE RESOURCES OF THE LITTLE RIVER BASIN, LOUISIANA, Geological Survey, Washington, D.C. M. W. Gaydos, J. E. Rogers, and R. P. Smith. Available from GPO, Sup Doc, Washington, DC 20402 Price 33.15. Water-Supply Paper 1989, 1973. 74 p, 10 fig, 4 plate, 2 tab, 30 ref.

Descriptors: *Water resources, *Groundwater, *Surface waters, *Louisiana, Data collections, Hydrologic data, Water quality, Streamflow, Water supply. Identifiers: *Little River basin(La).

The average flow of streams in the Little River basin of Louisiana is high, about 0.65 mgd per square mile, but many streams have little or no flow during parts of each year. Consequently, many streams are not dependable supply sources during the low-flow periods without storage. Streams in the southern part of the basin have sustained low flow and can be developed for municipal and small industrial supplies without storage. The Wilcox Group, the Sparta Sand, the Cockfield Formation, the Catahoula Sand, the Carnahan Bayou Member of the Fleming Formation, terrace deposits, and alluvial deposits contain freshwater in parts of the basin. Greatest develop-Ireshwater in parts of the basin. Greatest development has been from the Sparta, which also has the greates potential for future development. Groundwater quality problems are local rather than basinwide. Flood damage in the basin is minor because the broad, flat flood plains are relatively undeveloped. (Knapp-USGS) W74-07671

THE 7-DAY 10-YEAR LOW FLOWS OF IL-LINOIS STREAMS, Illinois State Water Survey, Urbana.

For primary bibliographic entry see Field 2E.

ECONOMIC OPTIMIZATION AND SIMULA-TION TECHNIQUES FOR MANAGEMENT OF REGIONAL WATER RESOURCE SYSTEMS, Texas Water Development Board, Austin. For primary bibliographic entry see Field 6A. W74-07714

A STREAMFLOW MODEL FOR METROPOLITAN PLANNING AND DESIGN, Metropolitan Sanitary District of Greater Chicago, For primary bibliographic entry see Field 2A.

ANALYTICAL TECHNIQUES FOR PLANNING COMPLEX WATER RESOURCE SYSTEMS. Texas Water Development Board, Austin. Systems Engineering Div.
For primary bibliographic entry see Field 6A.
W74-07722

OPTIMIZATION OF STOCHASTIC STORAGE MODELS FORMULATED BY P.A.P. MORAN, AND Z. KACZMAREK (OPTYMALIZAEJA STOCHASTYCZNYCH MODELI RETENCION-WANIA PODANYCH PRZES P.A.P. MORANA I Z. KACZMARKA), H. T. Mitosek.

Archiwum Hydrotechniki, Vol 20, No 3, p 309-335, 1973. 3 fig, 66 ref. (English Summary).

Descriptors: Methodology, *Stochastic processes, *Markov processes, Reservoir storage, *Model studies, *Optimization, *Mathematical models, *Reservoir operation, Evaluation, Inflow. Identifiers: Poland, Moran model, Kaczmarek

A methodology is presented concerning utilization of stochastic storage models for determination of release control rules under reservoir operation

Field 4-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A-Control Of Water On The Surface

plans securing optimization of economic effects. These models allow for evaluation of the reservoir operation in case the operation plan under the form of the so-called storage volume transition probabilities matrix is already known. Such evaluation depends on the assumptions concerning the random properties of the reservoir inflow process. Moran's model is based on the assumption of the nonstationary cyclic random process with independent variables, while Kaczmarek's model is based on the assumption of the nonstationary cyclic lag-one Markov process. Investigations based on the empirical material recorded for the Polish rivers indicate that the process of mean monthly flows (reservoir inflows) comply with the assumptions made in the Kaczmarek's model. (Sanduski-Franklin) W74-07747

HYDROLOGICAL ASPECT OF SURFACE RUN-

Jadaypur Univ., Calcutta (India). For primary bibliographic entry see Field 2A. W74-07756

HYDROLOGICAL FORECASTING AND WATER MANAGEMENT (IN RUSSIAN), E. G. Popov, and V. D. Komarov.

Meteorologiya i Gidrologiya, No 10, p 37-44, 1973. 8 ref. English summary.

Descriptors: Application methods, Efficiencies, *Hydrologic aspects, *Forecasting, *Water management(Applied), Research and development, Surveys, *Methodology. ment, Surveys, *Me Identifiers: *USSR.

Problems involving the application and efficiency of hydrological forecasting to water management in the Soviet Union are described. A brief survey of forecasting methods and primary tasks and trends of research in the field of hydrological forecasting is given. (Sandoski-Franklin) W74-07768

HYDROLOGIC MODELS OF THE GREAT

State Univ. of New York, Buffalo. Dept. of Civil Engineering. For primary bibliographic entry see Field 2H.

THE COLUMBIA INTERSTATE COMPACT:

W74-07826

POLITICS OF WATER RESOURCES IN THE PACIFIC NORTHWEST, Washington State Univ., Pullman. Dept. of Politi-

cal Science. For primary bibliographic entry see Field 6E. W74-07846

A SUMMARY OF QUANTITY, QUALITY AND ECONOMIC METHODOLOGY FOR ESTABLISHING MINIMUM FLOWS, Washington Univ., Seattle. For primary bibliographic entry see Field 6B.

W74-07847

WATER IN THE OKANOGAN RIVER BASIN, WASHINGTON,

Geological Survey, Tacoma, Wash. For primary bibliographic entry see Field 3B. W74-07907

SELECTIVE WITHDRAWAL FROM BEECH FORK LAKE, BEECH FORK RIVER, WEST VIRGINIA.

Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab. For primary bibliographic entry see Field 8B. W74-07914

ESTIMATED USE OF WATER IN FLORIDA,

Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 6D. W74-07917

HYDROLOGIC DATA FOR 1972, BROWARD COUNTY, FLORIDA.

Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 7C. W74-07918

RECLAMATION RESEARCH IN THE SEVEN-TIES--FIRST PROGRESS REPORT

Bureau of Reclamation, Denver, Colo. Available from Sup Doc, GPO, Washington, D.C. 20402 Price \$1.80. Research Report No 26 (Water Resources Technical Publication), 1974. 95 p, 79

Descriptors: *Research and development, *Water resources development, Governments, Weather Hydraulics, Engineering structures.

Identifiers: *Bureau of Reclamation.

This report covers significant progress made on the full range of U.S. Bureau of Reclamation research programs. The work involves water resources development, conservation, and utilization. Some of the projects discussed are long-term studies of weather modification, physical properties and behavior of materials, basic physical problems facing all water resources development organizations, and new studies of social, economic, ecological, and environmental con-cepts. (Knapp-USGS) W74-07922

TRANSIT LOSSES AND TRAVEL TIMES FOR RESERVOIR RELEASES, UPPER ARKANSAS RIVER BASIN, COLORADO,

Geological Survey, Denver, Colo. R. K. Livingston.

Colorado Water Resources Circular No 20, 1973. 39 p, 11 fig, 6 tab, 11 ref.

Descriptors: *Water loss, *Diverson losses, *Reservoir releases, Bank storage, Depression storage, Hydrograph analysis, Hydrograph Evapotranspiration, Evaporation, *Colorado. Hydrographs, Identifiers: Transportation loss, River(Colo).

Factors influencing reservoir releases were analyzed for the upper reach of the Arkansas River in Colorado. The time of travel of releases from Twin Lakes Reservoir to Colorado Canal, a distance of 175 miles, ranges from 29 to 69 hours depending on the antecedent flow of the Arkansas River; travel time from Turquoise Lake is 4 1/2 hours more and travel time of releases from Clear Creek Reservoir is 1 1/2 hours less. At the Colorado Canal, the streamflow hydrographs resulting from upstream reservoir releases are modified by channel and bank storage, inadvertent diversions, and evapotranspiration. During an average reservoir release of about 450 cubic feet per second for about 12 days, the released water arriving at the Colorado Canal is reduced by about 7% due to bank storage, by about 8% due to inadvertent diversions, and by about 1% due to evaporation. All release water in channel storage arrives at the Colorado Canal headgate during the release recession soon enough to be diverted and does not cause a loss. Transpiration losses are assumed to be negligible. Total average transportation loss is 16%; it can vary from about 6% to 28% due to the antecedent river conditions, the amount and duration of the reservoir release, and the time of year the release occurs. (Knapp-USGS) W74-07931

THE HYDROGEOLOGY AND UTILIZATION OF BRINES IN EL SALADO, CHILE, Birmingham Univ. (England). Dept. of Geology.

J. W. Lloyd. Ground water, Vol 12, No 2, p 72-77, March-April 1974. 4 fig, 2 tab, 7 ref.

Descriptors: *Brines, *Hydrogeology, *Deserts, Water supply, Water resources development,
Wateryield, Mining.
Identifiers: *Chile(Rio Salado catchment), Atacama Desert.

The comples hydrogeology of brines from their origin in the andes to their emergence as springs in the vicinity of El Salado, Chile, is described. The Rio Salado catchment is located in the southern Atacama Desert. The area is distinctly arid and no groundwater reserves originating from local recharge exist. To obtain water for a new copper ore processing plant, brines are being utilized. The long-term supply of brine will be adequate for the processing plant. A design for abstraction incorporating three filter drains with wooden pump housings was adopted to combat corrosion, incrus-tation and flood damage. (Knapp-USGS) W74-07936

MUNICIPAL AND INDUSTRIAL WATER

Kansas Univ., Lawrence. Dept. of Civil Engineer-

For primary bibliographic entry see Field 6D. W74-07968

REGIONAL ENERGY-WATER PROBLEMS NORTHEAST,

Delaware Univ., Newark. Water Resources Center. For primary bibliographic entry see Field 6D. W74-07971

ENERGY-WATER PROBLEMS, REGIONAL

REGIONAL ENERGY.
PACIFIC NORTHWEST,
Pacific State Univ., Fargo. Water For primary bibliographic entry see Field 6D. W74-07975

DYNAMIC PROGRAMING IMPROVED PROCEDURES AND THEIR PRACTICAL AI RESOURCE SYSTEMS.

Water Research Association, Marlow (England). For primary bibliographic entry see Field 6A. W74-08013

EARTHQUAKE DAMAGE COSTS IN THE DESIGN OF WATER RESOURCE SYSTEMS,

California Univ., Los Angeles. Dept. of Engineering Systems S. E. Jacobsen, M. Torabi, and P. P. Bansal.

Water Resources Research, Vol 10, No 2, p 176-182, April 1974. 2 fig, 7 tab, 8 ref.

Water Descriptors: distribution(Applied), Descriptors: Water distribution(Applied), *Earthquakes, *Damages, Costs, Evaluation, Probability, *Planning, *Design, Optimization, Methodology, Networks, Construction costs, Faults(Geologic), Equations, Systems analysis, Mathematical models, *California. Identifiers: *Seismic regions, Design intensity, *Cost minimization, Los Angeles(Calif.), San Fernando Valley(Calif.), Sensitivity, Earthquake oc-

currences, Random variables, Seismic data

A renewal theoretic cost model is developed for evaluating expected future damage costs due to earthquakes for a segment of a water distribution system located in a large seismic region. These costs depend upon the intensity that the structure is designed to withstand. A probabilistic model for the occurrences of earthquakes during a planning

WATER QUANTITY MANAGEMENT AND CONTROL-Field 4

Groundwater Management—Group 48

period in a region with several faults is used to obtain expected future damage costs as a function of design intensity. Damage cost, it is pointed out, depends upon what action is taken at the time of the damage. A numerical example using data obtained for the Los Angeles region is included to demonstrate the usefulness of the methodology; shown is how the least-cost design intensity for a structure at a given location can be easily calculated. The difficulties that arise in network systems problems are discussed. The analysis applies to individual links or arcs of a network. If the system problem is to design an entire water distribution network, subject to an overall budget constraint, then the sensitivity of costs to seismic parameters may greatly affect the optimal distribution of the budget to the various links of the system. (Bell-Cornell)
W74-08018

QUANTITY AND QUALITY OF SURFACE WATER IN MARION COUNTY, FLORIDA, Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 7C. W74-08044

PRESENT AND FUTURE OF LAKE SEVAN (SOVREMENNOYE SOSTOYANIYE I BU-DUSHCHEYE OZERA SEVAN), For primary bibliographic entry see Field 2H.

TRENDS AND PROBLEMS IN INVESTIGATION OF LONG-TERM FLUCTUATIONS OF RIVER RUNOFF (NAPRAVLENIYA I ZADACHI ISS-LEDOVANIYA MNOGOLETNIKH KOLEBANIY RECHNOGO STOKA), Akademiya Nauk SSSR, Moscow. Institut Vod-

nykh Problem. For primary bibliographic entry see Field 2E.

W74-08051

PROBLEM OF ASSESSING EFFECTS OF HUMAN ACTIVITY ON SURFACE-WATER RESOURCES (K PROBLEME OTSENKI VLIYANIYA DEYATEL'NOSTI CHELOVEKA NA RESURSY POVERKHNOSTNYKH VOD), Gosudarstvennyi Gidrologicheskii Institut, Lenin-

grad (USSR). I. A. Shiklomanov.

Meteorologiya i Gidrologiya, No 10, p 27-36, October 1973. 19 ref.

Descriptors: *Surface waters, *Water resources, *Human population, *Human resources, population, *Human resources, on, Water loss, Reservoir evaporation, Water *Evaluation, Water loss, Reservoir evaporation, Reservoirs, Water conservation, Irrigation, Water balance, Runoff, Economics, Conferences. Identifiers: *USSR.

In the work program of the Fourth Hydrologic Congress of the USSR considerable attention was given to problems relating to the study and evalua-tion of changes in hydrologic regime and water resources under the influence of man's economic activity. According to the character of this in-fluence on hydrologic processes, the economic factors can be tentatively divided into 3 groups: (1) factors that operate in the channel network and that redistribute river runoff in time and area (reservoir construction and operation, large water withdrawals, diversions of flow, etc.); (2) factors that alter relations among water-balance items in watersheds (agricultural measures, agricultural afforestation measures, urbanization, drainage of waterlogged lands, etc.); and (3) a combination of factors which are responsible for both direct removal of water from channels and for transformation of water-balance (irrigation of arid lands). To consider the effects of the first group of factors on the hydrologic regime, it is necessary to have reliable and complete data on the volume of water withdrawals for economic needs and of the discharges of used water into the river network.

Consideration of the remaining economic factors is more complex and requires detailed studies of fluctuations in climatic factors and of changes in water-balance and water-exchange items in the zone of aeration under natural and transformed water regimes. Problems of assessing changes in river runoff under influence of human economic activity are discussed in connection with problems relating to evaluation of the effects of irrigated agriculture and reservoir facilities on the country's water resources. According to calculations by water management agencies, approximately 90% of irretrievable water consumption in the country is presently expended on irrigation and evaporation from reservoirs. (Josefson-USGS) W74-08053

STATE RECORD KEEPING ON WATER AND ITS USAGE AND HYDROLOGIC CALCULA-IIS USAGE AND HYDROLUGIC CALCULA-TIONS AND FORECASTS (GOSUDARSTVENNYY UCHET VOD I IKH ISPOL'ZOVANIYA I GIDROLOGICHESKIYE RASCHETY I PROGNOZY), Hydrometeorological Service of the USSR,

Moscow. For primary bibliographic entry see Field 7A. W74-08054

PROBLEM OF RATIONAL USE AND CONSER-VATION OF WATER RESOURCES AND GOALS OF HYDROLOGY (PROBLEMA RAT-SIONAL'NOGO ISPOL'ZOVANIYA I OK-HRANY VODNYKH RESURSOV I ZADACHI GIDROLOGII), Hydrometeorological Service of the USSR,

For primary bibliographic entry see Field 6B. W74-08055

NATIONAL WEATHER SERVICE RIVER

NATIONAL WEATHER SERVICE RIVER FORECASTING SYSTEM, National Oceanic and Atmospheric Administration, Silver Spring, Md. Office of Hydrology. J. C. Monro, and E. A. Anderson. Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY5, Paper 10549, p 621-630, May 1974. 12 ref.

Descriptors: *Streamflow forecasting, *Runoff forecasting, Rainfall-runoff relationships, Mathematical models, Precipitation(Atmospheric),
*River forecasting, Data processing, *Computer
programs, *Model studies.
Identifiers: National Weather Service.

The National Weather Service River Forecast System methods and computer programs for effi-System methods and computer programs for ettri-cient operational river forecasting are described. A computer program performs all steps to convert the basic precipitation data to areal means. A procedure and computer programs needed for calibrating the basic conceptual model to a large number of basins in a reasonable time are described. The basic conceptual model has wide described. The basic conceptual moder has wide applicability. The inclusion of a snow-pack model and additions to the channel-routing procedure planned for the near future will make the model applicable over nearly all of the United States. (Knapp-USGS) W74-08057

DAM COLLAPSE WAVE IN A RIVER, Tippetts-Abbett-McCarthy-Stratton, New York. For primary bibliographic entry see Field 2E. W74-08060

AMELIORATIVE EFFECT OF FIELD SHELTERBELTS UNDER CONDITIONS IN THE URALS, (IN RUSSIAN),

URALS, (IN KUSSIAN),
L. S. Mochalkin.
Tr Ural Lesotekh Inst. 21. p 314-320, 1970.
Identifiers: *Cereal crops, Relative humidity,
*Shelterbelts, Soil temperature, *USSR(Urals),
Velocity, *Wind, Crop production.

The most effective protection proved to be the 2-5 fow field shelterbelts of open-permeable structure. The wind protective effect was manifest at a distance 25-30 times the height of the shelterbelt in the leeward side and 5 times the height in the windward side. Total reduction of wind velocity on the protected plot was 50-60%. On days with hot dry protected plot was 50-60%. On days with hot dry winds, air temperature in the inter-belt fields was lower than in open fields by 1-2 C. In fields with shelterbelts, the relative humidity of the air was higher by 4-5% on the average than in the open fields. The thickness of the snow cover in the Central Urals was 50-60 cm due to the protection by the shelterbelts; it was 12-30 cm in the open field. Soil humidity in inter-belt plots was, on the average, 3.5-4.1% higher than in the open fields. During the period of hot dry winds, soil tempera-During the period of hot dry winds, soil tempera-ture in fields with shelterbelt was lower by 1-1.5 deg., and during the days of cold winds it was higher by 1-5 deg. than in the open fields. In the southern part of the Urals in dry years, the addi-tional yield of cereal crops in sheltered fields at-tains 710 kg/ha or 147.9%. Data are presented on the course of growth of the species in the shelter-belt. Recommendations are given for shelterbelt arrangement, taking into account the gradient of arrangement, taking into account the gradient of the plots, the soil types and other factors.--Copyright 1973, Biological Abstracts, Inc.
W74-08100

STUDIES OF RE-VEGETATION IN VEHICLE TRACKS IN SVALBARD, (IN NORWEGIAN). O. Hjeljord.

Nor Polarinst Arbok. 1971. p 31-42, 1973. Illus. En-

glish summary. Identifiers: Dryas, Erosion, *Grasses, Moss, *Norway(Svalbard), Soil, *Vegetation re-establishment, Vehicle tracks, *Soil moisture, Thawing.

A study was made of vegetation changes and ero-sion in vehicle tracks in Svalbard (Norway). Revegetation appeared to be particularly slow on dry soils. Fifty-yr-old tracks on Dryas heaths were still without significant plant growth. This is believed to be due to the delayed thawing and the increased soil moisture in the tracks. Tracks on wet creased sou moisture in the tracks. Fracks on wet land, however, appeared to regain their original vegetation rapidly, provided the tracks did not form deep trenches. Severe disturbance of the moss tundra of inland valleys caused the moss to be replaced by a pioneer community consisting of different species of grasses. Vehicle tracks on marine clay sediments are believed more likely to cause erosion than tracks on well-drained moraine ridges.--Copyright 1973, Biological Abstracts, Inc. W74-08116

4B. Groundwater Management

ANALYSIS OF LIQUID-WASTE INJECTION WELLS IN ILLINOIS BY MATHEMATICAL MODELS, Illinois Univ., Urbana. Water Resources Center.

For primary bibliographic entry see Field 5B. W74-07604

WATER QUALITY AND TREATMENT OF DOMESTIC GROUNDWATER SUPPLIES, Illinois State Water Survey, Urbana For primary bibliographic entry see Field 5F. W74-07637

WELLS AND PUMPING SYSTEMS FOR DOMESTIC WATER SUPPLIES, Illinois State Water Survey, Urbana For primary bibliographic entry see Field 8B.

PLANNING A DOMESTIC GROUNDWATER SUPPLY SYSTEM, Illinois State Water Survey, Urbana.

Field 4-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4B-Groundwater Management

Survey Circular 116, 1973. 13 p, 4 fig, 8 ref, 2 apnend.

Descriptors: *Water wells, *Domestic water, "Hilinois, "Groundwater, Water supply, Planning, Water yield, Water quality, Water pollution control, Water treatment, Potable water.

Basic information needed to plan and develop a domestic groundwater supply is presented. A logical step-by-step planning summary is outlined. Accepted and recommended methods for a prospective owner of a domestic well to determine his water requirements and to gather meaningful information for planning his supply are presented. Groundwater is used as the source for almost all individual farm and domestic water supply systems in Illinois. Approximately 88% of the state's public water supplies also use groundwater as a source of supply. Altogether, groundwater supplies serve about 3,700,000 persons in the state, or approximately 34% of the total popula-tion. (Knapp-USGS) W74-07639

GEOLOGY AND GROUNDWATER RESOURCES OF THE HANGMAN CREEK DRAINAGE BASIN, IDAHO-WASHINGTON, Washington State Univ., Pullman. Dept. of Geolo-

gy. For primary bibliographic entry see Field 4A. W74-07644

GROUND-WATER RESOURCES OF MONT-GOMERY COUNTY, INDIANA, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 2F. W74-07645

GEOHYDROLOGY AND WATER RESOURCES OF THE TUCSON BASIN, ARIZONA, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 2F. W74-07648

WATER RESOURCES OF LEHIGH COUNTY.

PENNSYLVANIA, Geological Survey, Harrisburg, Pa. For primary bibliographic entry see Field 4A. W74-07649

GROUND-WATER LEVELS IN OBSERVATION WELLS IN KANSAS, 1966-70,

Geological Survey, Lawrence, Kans For primary bibliographic entry see Field 7C.

A GROUND-WATER MONITORING NET-WORK FOR KOOTENAI FLATS, NORTHERN

Geological Survey, Boise, Idaho. For primary bibliographic entry see Field 7A. W74-07662

HYDROLOGIC RECONNAISSANCE OF THE NORTHERN GREAT SALT LAKE DESERT AND SUMMARY HYDROLOGIC RECONNAIS-SANCE OF NORTHWESTERN UTAH, Geological Survey, Salt Lake City, Utah For primary bibliographic entry see Field 2F. W74-07665

GEOLOGY AND WATER RESOURCES OF THE WHARTON TRACT AND THE MULLICA RIVER BASIN IN SOUTHERN NEW JERSEY, Geological Survey, Trenton, N. J. Water Resources Div.

E. C. Rhodehamel. New Jersey Division of Water Resources Special Report No 36, 1973. 58 p, 15 fig, 8 tab, 65 ref.

Descriptors: *Water resources. *Groundwater. Surface waters, *Conjunctive use, *New Jersey, Sands, Hydrogeology, Water balance, Surface groundwater relationships.

Identifiers: *Mullica River(NJ), *Wharton *Mullica

Tract(NJ).

In order for the water resources of the Wharton Tract of New Jersey to be developed, the hydrology of the tract and the encompassing Mullica River basin were evaluated. The Wharton Tract is an area of 150 square miles located in the Mullica River basin in southern New Jersey's Pine Barrens region. The tract is a relatively flat, low-lying, generally sandy area containing shallowly incised streams. The larger streams are commonly bordered by swamps. The tract was pruchased by the State primarily as a water-supply preserve, and also for conservation and recreational purposes. Principal aquifers in the Wharton Tract and Mullica River basin are in the Kirkwood Formation of middle Miocene age, Cohansey Sand of Miocene, and Pliocene age, and in overlying hydraulically connected deposits of Quaternary age. Ground-water and surface water in the Mullica River basin are low in dissolved solids, generally less than 50 mg/liter. Iron concentrations are generally high, up to 49 mg/liter in groundwater and up to 7.1 mg/liter in the streams. The water is acidic. The Wharton Tract is well situated to support the growing water needs of nearby New Jersey communities. Maximum development of water can be achieved by conjunctive use of ground and surface water. During most of the year, some water would be withdrawn either directly from streams or from adjacent wells. During periods of low flow during summer or fall water would be pumped from wells farther from the streams. From analysis of flowduration curves it is estimated that 70 mgd of water could be developed with minimal effect upon low flows in the half of the tract above the gaging stations on the Mullica and Batsto Rivers. The quantity available in the entire tract is greater, possibly in the order of 150 mgd. With augmentation of streamflow by pumping from groundwater, it is likely that considerably more water could be safely used on a perennial basis. (Knapp-USGS)

WATER RESOURCES OF THE LITTLE RIVER

BASIN, LOUISIANA, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 4A. W74-07671

DEFORMATION MODULI OF WATER-BEAR-ING FORMATIONS AT ELEVATED TEMPERA-

California Univ., Berkeley. Coll. of Engineering. W. H. Somerton.

Available from the National Technical Informa-

tion Service as PB-232 152; \$3.75 in paper copy, \$1.45 in microf66 p, iche. California Water Resources Center, Davis, Contribution No 146, January, 1974. Completion Report, January 1974. 21 fig, 8 tab, 26 ref. OWRR A-042-CAL(2). UCAL-WRC-W-348.

Descriptors: *Compressibility, *Thermal conductivity, *Sandstones, *California, Measurement, Underground storage.
Identifiers: *Imperial Valley(Calif), Siltstone,

*Sonic velocity tests.

Measurements of sonic velocities, bulk and matrix compressibilities and thermal conductivities have been made on a group of outcrop sandstones and a group of siltstone cores obtained from wells drilled in the Imperial Valley, California. Results of these measurements, which were made at temperatures as high as 200 deg C and pressures to 16,000 psi, are presented and discussed relative to their application in high temperture underground reservoir studies. (Snyder-California, Davis) HYDROGEOLOGIC INVESTIGATION OF A SANITARY LANDFILL IN STRATIFIED GLA-CIAL DRIFT. Connecticut Univ., Storrs. Inst. of Water

Resources. For primary bibliographic entry see Field 5B. W74-07728

OPTIMUM DRILLING SITES FOR GROUND-WATER DEVELOPMENT ON THE EAST COAST OF LANAI ISLAND,

Water Resources Honolulu. Hawaii Univ., Research Center. W. M. Adams, and R. D. Huber.

Available from the National Technical Informa-tion Service as PB-232 155, \$3.25 in paper copy, \$1.45 in microfiche. Completion report, Technical report No 68, July 1973. 43 p, 9 fig, 3 tab, 11 ref. OWRR B-015-HI(7). 14-31-0001-3073.

Descriptors: *Sites, *Groundwater, Rainfall, Salinity, Temperature, Resistivity, Conductivity, Permeability, *Hawaii, *Drilling. Identifiers: Optimum sites, *Lanai Island(H.I.).

For a proposed reforestation of the canyon country of east Lanai, seedlings will be required. The seedlings could be grown in east Lanai, preventing the stress of transplantation from a dif-ferent environment, if an adequate source of high-quality water were available. This study was designed to locate such a source; more specifi-cally, to find optimal sites at which to drill for fresh water. Reconnaissance work in the field took place in July 1970. At 176 places along the eastern coastline, shallow observation wells were dug at the high-tide level during low tide. The temperature and salinity of the ground water there were measured. In most of the canyon gulches, electrical resistivity soundings of the Schlumberger configuration were made. Through analysis of the field data two sectors were identified on the eastern coast: the northern sector, from Federation Village to Lopa, and the southern sector, from Lopa to Naha. Evidence points to the southern sector as being the most promising region for drilling, and specific sites are suggested. However, while the southern sector is superior for the accumulation of ground water, its beach rock is more impermeable than that of the northern sector; hence the southern sector provides less favorable conditions for recharge of the water table. Thus, the southern sector should be developed if a relatively small amount of high-quality ground water is desired from many holes closely spaced along a line--as for the irrigation of seedlings. Should a relatively larger amount of lower-quality ground water be preferred, exploitation of the northern sector would be appropriate. W74-07734

THREE-DIMENSIONAL ZONE MODEL LOG

INTERPRETATION, Hawaii Univ., Honolulu. Water Resources Research Center. For primary bibliographic entry see Field 8G. W74-07735

RADIOACTIVITY OF NEVADA HOT-SPRING SYSTEMS, California Univ., Berkeley. Lawrence Berkeley

Lab. For primary bibliographic entry see Field 5A. W74-07786

PROJECT RIO BLANCO SPALL MEASURE-MENTS DATA REPORT,

California Univ., Livermore. Lawrence Livermore Lab.

C. Sisemore, and J. Toman.

Available from NTIS, Springfield, Va., as Rept. No. UCRL-51484; \$4.00 per copy, \$1.45 microfiche. Report No. UCRL-51484, November 1973. 38 p. 29 fig, 2 tab, 3 ref.

WATER QUANTITY MANAGEMENT AND CONTROL-Field 4 Effects On Water Of Man'S Non-Water Activities—Group 4C

Descriptors: *Natural gas, *Secondary recovery(Oil), *Nuclear explosions, *Well data, *Data collections Goalestons Postory(Oi), "Nuclear explosions, "Well data,"
Data collections, Geology, Strength, Yield strength, Properties, Measurement, Dispersion, Ground movement, Mass transfer, Seismic waves, Identifiers: *Spall data.

Project Rio Blanco was a joint government-indus-try experiment to stimulate a natural gas reservoir using nuclear explosives in a well bore. A major in-strumentation program was undertaken for the Rio Blanco experiment using accelerometers and velocity gages buried at various depths below the ground surface and at various horizontal ranges from the emplacement well. The objective was to physically measure the depth and aerial extent of spall (tensile failure of the earth material). Data from each of the instrument stations are given. along with the appropriate integrated data for particle velocity and displacement, or just displacement. (Houser-ORNL) W74-07797

THE ELECTRICAL RESISTIVITY METHOD

Keck Consulting Services, Inc., East Lansing, Mich.

For primary bibliographic entry see Field 7B. W74-07852

GROUNDWATER ISSUE MERITS MORE FEDERAL PROTECTION, GROUNDWATER POLLUTION AND CONSERVATION, For primary bibliographic entry see Field 5G. W74-07854

LOCATION AND CHARACTERISTICS OF THE INTERFACE BETWEEN BRINE AND FRESH WATER FROM GEOPHYSICAL LOGS OF BOREHOLES IN THE UPPER BRAZOS RIVER BASIN, TEXAS, Geological Survey, Denver, Colo.

For primary bibliographic entry see Field 8B. W74-07859

MICROPOROSITY IN CARBONATE ROCKS,

Amoco Research Center, Tulsa, Okla E. D. Pittman.

American Association of Petroleum Geologists Bulletin, Vol 55, No 10, p 1873-1878, October 1971. 3 fig, 12 ref.

Descriptors: *Carbonate rocks, *Porosity, Pores, Pore water, Permeability. Identifiers: *Micrite, *Microporosity, Aragonite, Calcite, Neomorphism.

Large pores in carbonate rocks hold and transmit ladige poles in carbonate micropores may hold ir-reducible water; i.e., water not available for flow. Analysis of borehole logs of microporous car-bonate rocks can result in misleadingly high calculated water saturations and possible bypassing of a potential oil or gas reservoir. Microporosity occurs in carbonate rocks that range from friable to well indurated. Intercrystalline micropores may be present in micrite and within ooids, pisolites, micrite intraclasts, pellets, and cryptocrystalline grains. Micropores in ancient rocks appear to result from (1) formation of micrite envelopes, (2) void space present after transition of aragonite to calcite, or (3) incipient weathering and dissolution. Aggrading neomorphism of micrite to microspar tends to destroy microporosity. (Staplin-NWWA)

VARIATIONS IN THE DESIGN OF DEPTH SAMPLERS FOR USE IN GROUNDWATER STUDIES, of Goological Sciences London

of Geological Sciences, London (England). Dept. of Hydrogeology. For primary bibliographic entry see Field 8G. W74-07865

ELECTRIC AND THERMAL PROPERTIES OF ROCKS.

For primary bibliographic entry see Field 8E.

WATER IN THE OKANOGAN RIVER BASIN, WASHINGTON,

Geological Survey, Tacoma, Wash. For primary bibliographic entry see Field 3B.

HYDROLOGY OF LIMESTONE KARST IN GREENBRIER COUNTY, WEST VIRGINIA, Geological Survey, Morgantown, W. Va. For primary bibliographic entry see Field 2F. W74-07908

RECONNAISSANCE OF THE WATER RESOURCES IN THE VICINITY OF PROPOSED DEEP-WELL INJECTION SITES SOUTHEAST DADE COUNTY, FLORIDA, Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 5B. W74-07915

ESTIMATED USE OF WATER IN FLORIDA.

Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 6D. W74-07917

HYDROLOGIC DATA FOR 1972, BROWARD

COUNTY, FLORIDA, Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 7C. W74-07918

HYDROLOGY AND CHLORIDE CONTAMINA-TION OF THE PRINCIPAL ARTESIAN AQUIFER IN GLYNN COUNTY, GEORGIA, Geological Survey, Atlanta, Ga. For primary bibliographic entry see Field 2F.

GEOHYDROLOGY OF THE BURIED TRIASSIC BASIN AT THE SAVANNAH RIVER PLANT, DuPont de Nemours(E.I) and Co., Aiken, S.C. Savannah River Lab. For primary bibliographic entry see Field 5B. W74-07934

EXPLORATION FOR A BURIED VALLEY BY RESISTIVITY AND THERMAL PROBE SUR-

VEYS, Harshbarger and Associates, Tucson, Ariz For primary bibliographic entry see Field 2F. W74-07935

ICELANDIC GEOTHERMAL ACTIVITY AND THE MERCURY OF THE GREENLAND THE MERCURY OF THE GREENLAN ICECAP, Hawaii Univ., Honolulu. Dept. of Microbiology.

For primary bibliographic entry see Field 5B.

THE ROLE OF WATER IN THE ENERGY CRI-

Water Resources Council, Washington, D.C. For primary bibliographic entry see Field 6D. W74-07962

REGIONAL ENERGY-WATER PROBLEMS--COLORADO RIVER-GREAT BASIN, Colorado State Univ., Fort Collins. Environmental Resources Center. For primary bibliographic entry see Field 6D. W74-07977

OPTIMAL TIMING AND SIZING OF A CON-JUNCTIVE URBAN WATER SUPPLY AND WASTE WATER SYSTEM WITH NONLINEAR PROGRAMMING, Loyola Univ., Los Angeles, Calif.

For primary bibliographic entry see Field 5D. W74-08010

OPTIMAL CONJUNCTIVE USE MODEL FOR INDUS BASIN, Colorado State Univ., Fort Collins, Dept. of Civil

M. T. Chaudhry, J. W. Labadie, W. A. Hall, and M. L. Albertson.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HYS, Paper 10550, p 667-687, May 1974. 3 fig, 1 tab, 16 ref, append. USAID Contract AID/csd-2162.

Descriptors: *Conjunctive use, *Mathematical models, Dynamic programming, *Irrigation water, Groundwater, *Optimization, Water resources development, Reservoir operation, Costs, Canals. Identifiers: *Pakistan(Indus River).

A mathematical model is presented as a tool for analysis and optimization of conjunctive use of surface water and groundwater resources of the Indus Basin in Pakistan. The size of the canal system, the surface reservoir, and the ground-water pumping facilities are calculated such that when the system is operated optimally, the capital, operation, and maintenance costs of meeting given irrigation water requirements are minimized. A mathematical model of the Marala Ravi link canal subsystem, which is uncoupled from other areas of the large, complex Indus Basin irrigation system, was developed. The mathematical programming problems is large scale and must be decomposed into subproblems and solved by dynamic programming. (Knapp-USGS) W74-08059

PRELIMINARY STUDY TO INVESTIGATE FEASIBILITY OF DESALTING GROUND WATER IN NORTH DAKOTA,

North Dakota State Water Commission, Bismarck. For primary bibliographic entry see Field 3A. W74-08066

GROUNDWATER POLLUTION AND CONSER-VATION. For primary bibliographic entry see Field 5B.

INJECTION WELLS POSE A POTENTIAL THREAT. For primary bibliographic entry see Field 5B. W74-08072

4C. Effects On Water Of Man'S Non-Water Activities

EFFECT OF DEICING CHEMICALS ON GROUND AND SURFACE WATER--(MODUS OPERANDI),

Geological Survey, Boston, Mass. For primary bibliographic entry see Field 5B. W74-07617

ESTIMATION OF IMPERVIOUSNESS SPECIFIC CURB LENGTH FOR FORECAST-ING STORMWATER QUALITY AND QUANTI-

Metropolitan Washington Council of Governments, Washington, D.C. Dept. of Health and Environmental Protection For primary bibliographic entry see Field 5B. W74-07640

Field 4-WATER QUANTITY MANAGEMENT AND CONTROL

Group 4C-Effects On Water Of Man'S Non-Water Activities

ALTERATIONS IN THE HYDROLOGIC CYCLE INDUCED BY URBANIZATION IN NORTHERN NEW CASTLE COUNTY, DELAWARE: MAGNITUDES AND PROJECTIONS.

Delaware Univ., Newark J. C. Albrecht.

Available from the National Technical Informa-\$1.45 in microfiche. Completion Report, April 1974. 22 p, 1 fig, 5 tab, 7 ref. OWRR A-017 DEL (2)

Descriptors: *Surface runoff, *Urban runoff, *Urban hydrology, *Groundwater, *Runoff, *Evapotranspiration, 'Hydrologic budget, *Evapotranspiration, Hydrologic budget, Hydrologic cycle, Hydrologic models, Computer models, Energy budget, Soil water, Water resources, Model studies, Watersheds(Basins), Small watersheds, Land use, Surface waters, On-site data collections, *Delaware. Identifiers: New Castle County(Delaware), Wilmington(Delaware), Shellpot Creek(Delaware), Shellpot

Creek(Delaware), Land use changes.

A model of surface runoff as a function of land surface characteristics in an urban residential area was developed from measured land surface characteristics, precipitation, and runoff data. Surface runoff from impervious surfaces feeding directly into drainage ways began after an initial extraction for wetting the surface of .03 inches (.08 inches after hot, sunny summer weather). Surface runoff from impervious surfaces draining onto lawns and gardens was counted as additional precipitation spread evenly over the vegetated surfaces. Surface runoff from vegetated surfaces was then estimated by the Soil Conservation Service's method for estimating storm runoff. The combined estimates for the different surface types cor-responded closely with measured runoff (r=.996, s=.06 in., a=.01, b=1.04). The model was used to evaluated the effects of urbanization on other evaluated the effects of urbanization on other components of the hydrologic cycle by incorpora-tion into a standard daily water budget run for Shellpot Creek Watershed, Wilmington, Delaware for 1954 to 1968. The application revealed a tripling of surface runoff, a one-half increase in total runoff, and a halving of both percolate to ground water and actual evapotranspiration as urbanized surface (residential use, 54 percent impervious surface) increased from 20 to 100 percent of the watershed area. W74-07729

CONTRIBUTION TO WATER POLLUTION FROM AGRICULTURAL AND UR SOURCES IN THE COACHELLA VALLEY, California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering. For primary bibliographic entry see Field 5B. W74-07757

PROCESSES, PROCEDURES, AND METHODS TO CONTROL POLLUTION RESULTING FROM ALL CONSTRUCTION ACTIVITY. Hittman Associates, Inc., Columbia, Md For primary bibliographic entry see Field 5B. W74-07942

PROBLEM OF ASSESSING EFFECTS OF HUMAN ACTIVITY ON SURFACE-WATER RESOURCES (K PROBLEME OTSENKI VLIYANIYA DEYATEL'NOSTI CHELOVEKA NA RESURSY POVERKHNOSTNYKH VOD), Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR).
For primary bibliographic entry see Field 4A.
W74-08053

HYDROLOGICAL INVESTIGATIONS

Akademiya Nauk SSSR, Moscow. Laboratoriya Lesovedeniya. Nauka, Moscow. 1970. 155 p, Illus.

Identifiers: *Forests, *Hydrological studies, Minerals, Precipitation(Atmospheric), *Runoff,

Problems of variations of surface runoff in different forest growing zones on water-catchment basins are examined. The variations of the runoff depth as influenced by the forest cover percentage of water catchment basins, as well as the significance of clearcuttings for the runoff of atmospheric precipitation and the loss of mineral substances, are shown.--Copyright 1973, Biological Abstracts, Inc. W74-08140

4D. Watershed Protection

SEDIMENT DISTRIBUTION IN A BEACH RIDGE COMPLEX AND ITS APPLICATION TO ARTIFICIAL BEACH REPLENISHMENT. Geological Survey, Urbana, Ill. For primary bibliographic entry see Field 2J. W74-07666

ANNUAL PEAK DISCHARGES FROM SMALL DRAINAGE AREAS IN MONTANA, THROUGH DRAINAGE AREAS IN MOUTAGE, TARRES SEPTEMBER 1972,
Geological Survey, Helena, Mont.
For primary bibliographic entry see Field 2E.

W74-07667

APPLICATION OF REMOTE SENSING TO HYDROLOGY--FINAL TECHNICAL REPORT. IBM Electronics Systems Center, Huntsville, Ala. For primary bibliographic entry see Field 2A.

EFFECT OF THE STAND DENSITY OF WAL-NUT FORESTS ON SURFACE RUNOFF AND SOIL EROSION ON THE SPURS OF THE SOUTHWESTERN SLOPE OF THE DARVAZA RANGE, (IN RUSSIAN), I. Dzhabarov.

Tr Tadzh Nauchno-Issled Inst Pochvoyed, Vol 13. No 2, p 136-143. 1970.

Identifiers: *Erosion, *Forests(Stand density), Juglans-Regia, Range, Runoff, Slopes, Soils, USSR(Darvaza Range), *Walnut.

Ground soil conditions (soil texture and chemical composition), gradients, and degree of vegetation cover are described. In 1963, the surface runoff under stands of Juglans regia of 0.3 density was 30.4 m3/ha and the erosion of solid matter was 139 kg/ha. In walnut stands with a 0.6 density, there was almost no surface runoff (0.8 m3/ha), and no erosion was observed. On plots of natural herbaceous stands with a projection cover of 30%, surface runoff was 116.6m3/ha, erosion-121.5 kg/ha. In 1965 under stands with a 0.3 density, surface runoff was 16 m3/ha, erosion-34.1 kg/ha, and at a stand density of 0.6, surface runoff was 0.6 m3/ha and there was no erosion. Soil erosion on forestless areas is related to topographical features: granients of 15-30 deg predominate on 71% of the territory investigated.—Copyright 1973, Biological Abstracts, Inc. W74-08137

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

MEASUREMENTS IN WATER QUALITY MONITORING,
Minnesota Univ., Minneapolis. Dept. of Civil and

Mineral Engineering. W. J. Maier, and H. L. McConnell.

Journal Water Pollution Control Federation, Vol. 46, No 4, p 623-633, April 1974. 3 fig, 5 tab, 25 ref.

*Organic matter. *Biochemical oxygen demand, *Water quality, Sampling, *Minnesota, Lakes, Rivers, Alkalinity, Instrumentation, *Monitoring. Identifiers: Organic carbon.

A commercially available instrument for the determination of organic and inorganic carbon was used in a 1-year test program of water quality sampling in Minnesota. All natural waters contained sub-stantial concentrations of organic carbon, ranging from 5 mg/liter in Lake Superior to 15 to 30 mg/lite in the larger rivers. These concentrations increased in the downstream direction. Total organic carbon and biochemical oxygen demand were only weakly correlated, but total inorganic carbon was closely correlated with alkalinity. While the presence of organic carbon may not in itself be detrimental, it suggests the need for continuous surveillance and adequate treatment of water supplies. (Knapp-USGS) W74-07641

TRACE METALS INVESTIGATIONS, Westinghouse Electric Corp., Pittsburgh, Pa. For primary bibliographic entry see Field 5B. W74-07655

QUALITY OF SURFACE WATER IN ILLINOIS.

Harmeson, T. E. Larson, L. M. Henley, R. A. Sinclair, and J. C. Neill.

Note: 56, 1973, 100 n., 2 fig. 8 tab. Bulletin 56, 1973. 100 p, 2 fig, 8 tab.

Descriptors: *Water quality, *Surface waters, *Illinois, Statistics, Water temperature, Turbidity, Dissolved solids, Hardness(Water), Alkalinity, Nitrates, Manganese, Phosphates.

Surface water quality in 25 streams at 30 sampling locations in Illinois is summarized for a 5-year period from 1966 through 1971. Results of statistical analyses are given with graphic summaries for temperature, turbidity, total dissolved minerals, hardness, alkalinity, nitrate, and manganese. Available data on phosphates are included in the statistical analyses. Summaries of these data for each sampling location, arranged alphabetically by stream name, are accompanied by the tabulations of mineral quality for the streams sampled, with available physical data. The analyses of water quality present a representative picture of stream conditions during a particular sampling period. These data can serve as a base for comparison and evaluation of existing quality with manmade stan-dards that are often established arbitrarily or may be based on more or less ideal conditions. (Knapp W74-07678

METHODS OF ANALYSIS.

Arbetsmedicinska Institutet, Stockholm (Sweden). Dept. of Chemistry.
G. Lindstedt, and S. Skerfving. In: Mercury in the Environment, (Chemical Rubber Co. Press), p 3-13, 1972, 1 fig, 3 tab.

Descriptors: *Pollutant identification, *Mercury, *Analytical techniques, *Measurement, Water pollution, Air pollution, Colorimetry, Neutron activation analysis, Spectrophotometry, Instrumen-tation, Evaluation, Toxicity, Organic compounds, Inorganic compounds.

An evaluation of some important methods used in the analysis of mercury in air and in biological material is presented. Air sampling methods and direct reading methods are used in determining the mercury vapor in the air of industrial facilities where it presents a potential health hazard. The air sampling method using dithizone requires a 20 liter

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sample with a detection limit of 1 micro g/sample. Direct reading methods can detect about 2 micro-grams/m3 if there is no interference from other grams/ms in there is no interfect from other vapors. Colorimetric analysis, atomic absorption analysis, neutron activation and the micrometric method are described and compared in their ability to detect total mercury in biological material. In a comparison, neutron activation, flameless atomic absorption and flame atomic absorption gave overall average detection levels close together but the flame atomic absorption method had much lower precision than the other two. From a tox-icological point of view, most of the modern methods of analysis of total mercury meet the demand for a reasonable degree of reliability. For analysis of total mercury in blood, activation analysis and flameless atomic absorption are the methods of choice. Methods for separating organic from inorganic mercury in biological material are thin layer chromatography, isotope exchange and stannous chloride reduction. Specific methods for organic mercury analysis are presented. (See also W74-07680) (Jerome-Vanderbilt)

THE DISTRIBUTION OF LEAD IN HUMAN

DECIDUOUS TEETH, Harvard Medical School, Boston, Mass. For primary bibliographic entry see Field 5C. W74-07691

SOLVENT EXTRACTION OF SELENIUM (IV) WITH 2-THENOYLTRI-FLUOROACETONE, Indian Inst. of Tech., Bombay, Dept. of Chemis-

try. S. B. Akki, and S. M. Khopkar. Separation Science, Vol 6, No 3, p 455-460, June 1971. 2 fig, 2 tab, 3 ref.

Descriptors: *Spectrophotometry, *Selenium, *Ions, *Separation techniques, *Solvent extractions, Analytical techniques, Metals, Chemical analysis, Evaluation, Measurements, Laboratory tests, Solvents, *Pollutant identification.

A simple, rapid method is presented of solvent extraction of selenium (IV) at trace concentrations, with 2-thenoyltrifluoroacetone-xylene (0.03M) at pH from 1.0 to 4.5. Selenium has been determined in the organic phase photometrically by complexa-tion with 3, 3 -diaminobenzidine. The system conforms to Beer's law in the concentration range of 2.2-13.2 micrograms/ml of selenium, and is a stable complex. The chlorides of lithium, ammonium, and calcium (0.5-3.0M) were used as the salting-out agents and had no effect on the extraction. Selenium can be extracted and determined in one operation in the presence of several other ele-ments with this method. (Jerome-Vanderbilt) W74-07692

PAPER CHROMATOGRAPHIC AND ELEC-TROCHROMATOGRAPHIC SEPARATION OF EDTA COMPLEXES OF METAL IONS.

Z. H. Coll. of Engineering and Technology, Aligarh (India). M. Qureshi, and J. P. Rawat.

aration Science, Vol 6, No 3, p 451-454, June Separation Scient 1971. 2 tab, 6 ref.

Descriptors: *Chromatography, *Aqueous solutions, *Metals, *Ions, Analytical techniques, themical analysis, Inorganic compounds, Aluminum, Beryllium, Iron, Cobalt, Copper, Manganese, Zinc, Chelation, Laboratory tests, Testing procedures, Separation techniques, *Pollutant Identifiers: *EDTA complexes.

A study is described of the chromatographic separation of EDTA complexes of metal ions and of the effect of EDTA concentration on R(f) values. Complexes were prepared by reported methods and dissolved in deionized water. Various solvent systems were tried in order to study the

separation of Al, Be, Fe, Co, Cu, Mn, and Zn in ways which would not break the complexes; results are presented. Also presented are results of paper electrophoresis which was also performed in four solvent systems. EDTA complexes were very stable and therefore difficult to detect. Neutral or alkaline media were used because EDTA complexes are not stable in acidic media. EDTA complexes are only soluble in water-like systems, hence nonpolar solvents can be used only in combination with water. From electrophoresis studies, it appears that Mn and Be can be separated from Al, Zn, Co, Cu, and Fe. (Jerome-Vanderbilt) Al, Zn, Co, W74-07693

METHODS OF MERCUROMETRIC VESTIGATIONS,

E. A. Sergeev. E. A. Sergeev. International Geology Review, Vol 3, p 93-99, 1961, 7 fig, 2 ref. Translated from Geok-himicheskiye Poiski Rudnykh Mestorozhdenii v SSSR, 1957.

Descriptors: *Mercury, *Rocks, *Geochemistry, *Analytical techniques, Geological surveys, *Spectroscopy, Metals, Heavy metals, Instrumen-tation, Lead, Mining. Identifiers: Ores, USSR.

A spectroscopic method of analysis of rocks for the presence of mercury in minute concentration is described. Sensitivities to 0.02 ppm are possible. Its usefulness in geochemical exploration is illustrated by application of the technique to the Khaidarkanskoe ore field. Variants of the method and examples of other successful field applica-tions are given. (Oleszkiewicz-Vanderbilt) W74-07695

USGS COMPLETES NATIONWIDE RECONNAISSANCE OF METALS IN STREAMS. Water and Sewage Works, Vol 118, No 6, p 174-175, June 1971, 2 tab.

Descriptors: *Heavy metals, *Surface waters, *Data collections, *Sampling, Lakes, Rivers, Streams, Surveys, Evaluation, Investigations, Measurement, Metals, Arsenic compounds, Cadmium, Chromium, Cobalt, Lead, Mercury, Zinc, Public health, Water pollution, Potable water.

A summary is presented of a U.S. Geological Survey report on the concentrations of arsenic, cadmium, chromium, cobalt, lead, mercury, and zinc in the nation's surface waters. More than 720 water samples were taken from urban and rural locations in all 50 states, Puerto Rico and the District of Columbia. The samples were collected during low streamflows, which would result in accentuated concentrations of the metals. Although small amounts of the metals were found to be widely distributed in streams and lakes, there was no widespread occurrence of amounts exceeding the widespread occurrence of amounts exceeding incurrent Public Health Service drinking water standards. A listing of 44 sites in 10 states where one or more of the metals exceeded the PHS drinking water standards is presented. Concentrations of dissolved mercury ranged up to 4 micro-grams/liter. Only 2% of the samples exceeded the limit for arsenic; while 4% had levels above the limit for cadmium. Concentrations of lead were generally low, less than 2% of the samples con-tained detectable chromium, cobalt was found in 37% of the samples, and zinc was detected most commonly in ranges from 10 to 50 micrograms/liter. This study will be used along with further investigation to establish baseline data for these metals. (Jerome-Vanderbilt) W74-07698

MERCURY ANALYSIS BY ATOMIC ABSORP-

TION SPECTROPHOTOMETRY, Duval Corp., Tucson, Ariz.

Atomic Absorption Newsletter, Vol 6, No 5, p 104-105, September-October 1967. 2 tab, 2 ref.

Descriptors: *Mercury, *Analysis, *Analytical Descriptors: "Mercury, Analysis, Analysis, techniques, "Spectrophotometry, Absorption, Extraction, Sampling, Laboratory tests, Geochemistry, Heavy metals, "Pollutant identification.

Identifiers: "Atomic absorption spec-

Samples of various types found in the mining industry are assayed for mercury. The element is extracted as the tetra-iodo-mercurate into ketone from an ammoniacal solution. The analysis was performed on an atomic absorption spec-trophotometer using a wide slot burner and a low fuel flow rate. Reproducibility is quite good over a range common to mercury ores. With slight changes the method can be made to cover the geochemical range as well. (Oleskiewicz-Vanderbilt) W74-07704

TRACE METALS IN ATMOSPHERIC PARTICULATES AND ATOMIC ABSORPTION SPECTROSCOPY, Instrumentation Lab., Inc., Lexington, Mass.

J. Y. Hwang. Analytical Chemistry, Vol 44, No 14, p 20A-27A, December 1972. 6 tab, 46 ref.

Descriptors: *Spectroscopy, *Trace elements, *Measurement, Evaluation, Chemistry, Analytical techniques, Atmosphere, *Air pollution, Sampling, Filters, Filtration, Laboratory tests,

Digestion, *Pollutant identification.

Identifiers: *Atomic absorption spectroscopy.

Trace metal particulate matter in the atmosphere and the application of atomic absorption spectroscopy to detect its presence and concentration are discussed. Means of circumventing the dif-ficulties encountered in this method of analysis are suggested. In obtaining samples, the organic membranes are the purest, but glass fiber filters are adequate, if the sample is gathered over about 24 hours. A low temperature ashing technique is recommended to avoid elemental loss. The sensitivities of various atomic absorption techniques are discussed and tables of their sensitivities are presented. Flameless techniques have excellent sensitivities at nano- and picogram levels, but may require pretreatment and pre-concentration. Methods of dealing with interferences are discussed. Atomic absorption speciroscopy is a useful tool which provides sensitivity, selectivity, simplicity and excellent reproducibility in comparison with other analytical techniques. (Jerome-Vanderhilt)

ANALYSIS OF TRACE METAL PARTICU-LATES IN ATMOSPHERIC SAMPLES USING X-

Dayton Univ., Ohio. T. R. Dittrich, and C. R. Cothern.

Journal of the Air Pollution Control Association, Vol 21, No 11, p 716-719, November 1971. 6 fig. 2

Descriptors: *Trace elements, *Metals, *Air pollution, Analysis, Sampling, Iron, Copper, Zinc, Lead, Cadmium, Titanium, Instrumentation, Absorption, Neutron activation analysis, *Pollutant

identification.
Identifiers: *X-ray fluorescence, Atomic absorption spectroscopy, Selenium, Sensitivity, Accuracv. Air samples.

Trace metals collected on filter paper by a hi-volume air sampler for 24 hours were analyzed using the X-ray fluorescence method. A gamma ray exciting source (241Am) and a bremsstrahlung exciting source (147Pm) were both used to produce the X-rays, the latter being more efficient. For the samples collected in Dayton, several metals were detected, viz.: Ti, Fe, Cu, Zn, Pb, Cd, and Sn. Elements in the periodic table between Ti and Cs were seen to have a sensitivity limit of 0.5

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micrograms/cu.m of air. (Oleszkiewicz-Van-W74-07709

THE DETERMINATION OF MERCURY IN AIR SAMPLES AND BIOLOGICAL MATERIALS, Ottawa Occupational Health Div. (Ontario). J. L. Monkman, P. A. Maffett, and T. F. Doherty. Industrial Hygiene Quarterly, Vol 17, No 4, p 418-420, 1956. 4 fig, 5 ref.

Descriptors: "Mercury, "Analytical techniques, "Chemical analysis, "Sampling, "Organic matter, "Air pollution, Separation techniques, Instrumentation, Analysis, "Pollutant identification. Identifiers: Biological samples, Sensitivity, Vapor detector

A method is described for the cold digestion of urine with potassium permanganate and sulfuric acid, which eliminates many hours of work. The mercury is isolated by filtering the treated sample through a glass filter pad impregnated with cadmium sulfide. The pad, containing the mercury as the sulfide, is placed in a micro gas chamber connected to a G.E. Instantaneous Vapor Detector equipped with a recorder. The gas chamber is heated and compressed air passed through the system to carry the liberated vapor into the detector. The area under the curve traced by the recorder is proportional to the amount of mercury in the sample. The method as outlined allows the determination of 0.1 to 10 plus or minus 0.1 micrograms of mercury. Greater sensitivity may be achieved if desired. (Oleszkiewicz-Vanderbilt) W74-07710

LEAD DETECTION IN LIVING PLANT TISSUE USING A NEW HISTOCHEMICAL METHOD, California Univ., Los Angeles. School of Engineering and Applied Science.

Journal of the Air Pollution Control Association, Vol 22, No 6, p 463-467, June, 1972. 5 fig, 21 ref.

Descriptors: *Lead, *Plant tissues, Chemical analysis, Trees, Air pollution, Path of pollutants, Trace elements, Analytical techniques, Sampling, Separation techniques, Analysis, Cytological stu-dies, Vegetation, Pollutant identification. Identifiers: *Histochemical methods, Automobile exhausts, Sensitivity.

A quick, simple method for identifying and distin-A quick, simple method for identifying and distinguishing lead from other heavy metals in living plants has been developed using sodium rhodizonate (C606Na2) which forms a scarlet precipitate with lead at approximately pH 2.8. Hand sections of plant tissues are treated with rhodizonate reagent, buffered, and examined microscopically. Very little time and/or effort is required for this method. Those cells and tissues contaminated with lead turn scarlet--color intensity being directly related to concentration. Lead may be detected in quite low concentrations and, most importantly, may be observed in situ; its entry and movement through the plant can thus be followed. In an area of moderate traffic of Downey, California (Southeast Los Angeles), lead was found abundantly on leaves as well as on and in roots of garden-grown lettuce; origin of this lead is presumed to be car exhausts. (Oleszkiewicz-Vanderbilt) W74-07711

DETERMINATION OF COPPER AND ZINC IN BIOLOGICAL MATERIAL,

Veterans Administration Hospital, Omaha, Nebr. M. M. Parker, F. L. Humoller, and D. J. Mahler. Clinical Chemistry, Vol 13, No 1, p 40-48, January 1967. 5 tab. 7 ref.

*Copper, Urine, Milk, Analytical Analysis, *Spectrophotometry, Urine, Milk, Analytical techniques, Separation techniques, Analysis,

Metals, Heavy metals, Chelation, Laboratory tests, Instrumentation, *Pollutant identification. Identifiers: *Atomic absorption spectroscopy, *Biological samples.

Copper and zinc are readily determined in biological material by atomic absorption spec-trophotometry. Two procedures are presented for the quantitative estimation of these metals in serum. One of these involves simple dilution and serum. One of these involves simple dilution and aspiration into the burner of the instrument. Suitably prepared standards must be used. The other method involves trichloroacetic acid preparation of the proteins prior to aspiration. With both methods satisfactory results in precision and recovery of added metals are obtained.
Urinary copper determinations require chelation of the metal with ammonium pyrrolidino dithiocarbamate or some similar sequestering agent and concentration by extraction of the chelate into a concentration by extraction of the chelate into a suitable organic solvent. A similar procedure must be used in analyzing cow's milk for copper. Tissue analysis requires heating with boiling nitric acid and removal of the acid under reduced pressure prior to aspiration into the burner. It has been shown that procedural errors in such determinations are very much smaller than biological varia-tion. (Oleszkiewicz-Vanderbilt) W74-07712

AN INVESTIGATION OF THE WATER QUALI-TY AND PRODUCTIVITY OF POLSON BAY,

FLATHEAD LAKE, MONTANA, Montana Univ., Missoula. Dept. of Zoology For primary bibliographic entry see Field 5C.

TESTACEA (PROTOZOA: SARCODINA) AS IN-DICATORS OF WATER QUALITY
WESTERN MONTANA,
Montana Univ., Missoula. Dept. of Zoology.

Available from the National Technical Information Service as PB-232 118; \$3.00 in paper copy, \$1.45 in microfiche. Montana Water Resources Research Center, Bozeman, Completion Report No 49, January 1974. 7 p, 5 ref. OWRR A-No 49, Janua 038(1)MONT.

Descriptors: *Protozoa, Water quality, Water analysis, *Nutrients, *Montana, Lakes, Ponds, Sampling, Sediments, *Periphyton, *Pollutant identification. Identifiers: *Testacea.

Water, sediment and periphyton samples were col-lected in a variety of aquatic habitats in western Montana, especially from a chain of 13 confluent lakes and ponds in the South Cold Creek Drainage of the Mission Mountains. Chemical and physical data were obtained at the site with the use of a portable test kit; associated dominant faunal and floral elements were noted; some water samples were returned for laboratory analysis, including sediment and periphyton samples. Nearly 40 species of testacea were identified. The study was successful in establishing equivalent and meaning-ful sampling procedures, but the data did not yield very meaningful information on the characteristics of the habitats represented. Future studies should involve more comprehensive and revised sampling techniques. Testacea do not appear to be very useful indicators for momentary water quality. Frustules of plants may be better indicators over many years, for the arenaceous shells of some of the Testacean species decompose in sediments. (Williams-Montana State) W74-07718

THE SIGNIFICANCE OF RAINFALL ON SALT AND SODIUM ACCUMULATIONS UNDER IR-

South Dakota State Univ., Brookings. Dept. of Plant Science.
For primary bibliographic entry see Field 3C.
W74-07743

THE DETERMINATION OF HEAVY METALS IN DOMESTIC SEWAGE TREATMENT PLANT

Toronto Univ. (Ontario). Dept. of Geology. J. C. Van Loon, J. Lichwa, D. Ruttan, and J.

Water, Air, and Soil Pollution, Vol 2, No 4, p 473-482, December 1973. 9 tab, 10 ref.

*Pollutant Descriptors: identification. Descriptors: "Pollutant identification, *Spectroscopy, "Heavy metals, Analytical techniques, *Sewage treatment, Treatment facili-ties, Solid wastes, Liquid wastes, Waste water treatment, *Sampling, Laboratory tests, Control systems.

Identifiers: *Atomic absorption spectroscopy.

Atomic absorption spectroscopy procedures are outlined for the determination of some important heavy metals in sewage treatment plant solids and liquids. Problems associated with sample preparation and sample solution interferences are described. It is recommended that reference stan-dards and internal laboratory control samples be used to allow some assessment of the validity of results. Sewage treatment plant products, both liquid and solid, were analyzed and results are given for samples representing a wide range of sewage input patterns. (Sandoski-Franklin) W74-07763

INTERDISCIPLINARY MONITORING OF THE NEW YORK BIGHT, Grumman Aerospace Corp., Bethpage, N.Y.

W. G. Egan, J. M. Cassin, and M. E. Hair. Environmental Letters, Vol 2, No 4, p 205-215, 1972. 5 fig. 7 ref.

Descriptors: *Measurement, *On-site investiga-tions. Feasibility studies, *Instrumentation, tions, Feasibility studies, *Instrumentation, *Monitoring, Performance, Hydrogen ion concentration, Dissolved oxygen, Chlorophyll, Mineralogy, Thermocline, Salinity, *Water pollution, New York, Bioluminescence.
Identifiers: *New York Bight.

Measurements were made in the New York Bight during 1969-1970 using in situ instrumentation together with monitoring devices for performance verification. Feasibility studies indicated that in situ instrumentation can measure chlorophyll, bioluminescence, Gellbstoff, hydrogen ion centration, dissolved oxygen, salinity and the loca-tion of the thermocline. It is maintained that in situ instrumentation may be adapted to continuous synoptic monitoring of the estuarine and oceano-graphic parameters necessary for mathematical modeling. (Sandoski-Franklin) W74-07764

A STUDY OF POLLUTANT DISCHARGES FROM REACTOR OPERATIONS UTILIZING ULTRACENTRIFUGATION TECHNIQUES,

Oak Ridge Gaseous Diffusion Plant, Tenn.

J. W. Amburgey, Jr. Available from NTIS, Springfield, Va., as Rept. No. K-1754; \$4.00 per copy, \$1.45 microfiche. Re-port No K-1754, August 1968. 36 p, 3 fig, 18 tab, 1

Descriptors: *Nuclear powerplants, *Nuclear reactors, *Nuclear wastes, *Cooling water, Effluents, *Columbia River, Analytical techniques, Centrifugation, Radiochemical analysis, Radioisotopes, Limnology, Elements(Chemical), Suspended load, Chromium, Sulphur, Zinc, Washington

Identifiers: Hanford site(Wash), Elemental analy-

Reactor cooling water samples from the Hanford Operation at Richland, Washington, have un-dergone particulate separations and study utilizing recently developed ultracentrifugation techniques. The suspended particles contained in these sam-ples were separated into classified groups and then

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subjected to a variety of analytical investigations including elemental and radiochemical analyses. The samples selected for study were taken in sets ranging from one to four samples per set. Six sets or a total of sixteen samples were collected and shipped to the Biophysical Limnology Laboratory at Oak Ridge for study. The analytical results from these investigations are summarized in a series of tables. The content of selected elements and the radioactivity for the more prominent radionuclides are shown as associated with either the particulate or the dissolved fractions contained in the original sample volume. A few of the radionuclide parent elements such as chromium, sulphur, and zinc were found almost entirely associated with the dissolved materials fraction. These results along with the other data showed that the suspended materials isolated from the various samples of reactor cooling water did not add significantly to the production of radionuclides and the radioactive pollution of the Columbia River at Hanford. (Houser-ORNL) W74-07782

FRACTIONATION OF SUSPENDED AND COL-LOIDAL PARTICLES IN NATURAL WATER, Oak Ridge Gaseous Diffusion Plant, Tenn.

W. T. Lammers.

Available from NTIS, Springfield, Va., as Rept. No. K-1749; \$4.00 per copy, \$1.45 microfiche. Report No. K-1749, October 1968, 42 p, 9 fig, 90 ref.

*Analytical Descriptors: techniques. *Centrifugation, *Laboratories, *Research facilities, *Suspended load, Natural streams, Water pollution, Water pollution control, Chemical proportion, water pointed control, chemical pro-perties, Physical properties, Biological properties, Instrumentation, Mathematics. Identifiers: *Natural waters.

Feasibility studies were conducted on the use of centrifugal techniques for isolating insoluble materials from samples of natural water. The isolated particulate fractions were then used in stu-dies encompassing several areas of water pollution with particular emphasis on the characterization of different groups of isolated particles. These characterizations were confined to the physical, chemical, and biological properties of suspended and colloidal particles which influence their separation, concentration, and analysis. Systems separation, concentration, and analysis. Systems and techniques were developed for separating these materials into relatively pure particulate groups and for making reliable analytical determinations. Particle characterization methods and the instruments, techniques, and calculations used in isolating the different particulate groups for study are described. (Houser-ORNL) W74-07783

RADIOACTIVITY OF NEVADA HOT-SPRING

SYSTEMS, California Univ., Berkeley, Lawrence Berkeley

Lao.
H. A. Wollenberg.
Available from NTIS, Springfield, Va., as Rept.
No. LBL-2482; \$4.00 per copy, \$1.45 microfiche.
Report No. LBL-2482, January 1974. 15 p, 5 fig, 3

Descriptors: *Radioactivity, *Measurement, *Assay, *Hot springs, *Nevada, Water pollution, Water pollution sources, Radium, Calcium, Calci um carbonate, Uranium, Flow.

Field gamma radiometry and laboratory gamma-ray spectrometry of waters and spring deposits were accomplished for some hot-spring systems in northern Nevada. Gamma-ray dose rates mea-sured on-site range from 2 to 500 microrem/hr, and depend, manly, on the amounts of the natural depend mainly on the amounts of the natural radioelements in the spring deposits. At several locations Rn-222, emanating from the water causes recognizable gamma-ray anomalies. High radioactivities, primarily from Ra-226, are associated with hot-spring systems dominated by CaCO3, while

silica-dominated systems are relatively low in radioactivity. Gamma spectrometry disclosed the enrichment of Ra-226 with respect to its parent U in CaCO3-dominated systems. Ra-226 preferentially associates with Ca: therefore, where tufa and siliceous sinter are present in a deposit, the calcareous material is highest in radioactivity. Spring deposits at fast-flowing CaCO3-dominated systems are generally less radioactive than calcareous deposits at slower flowing springs. (Houser-ORNL) W74-07786

URANIUM-234, Atomizdat, Moscow (USSR). For primary bibliographic entry see Field 5B.

FINAL ENVIRONMENTAL STATEMENT RE-POWER PLANT, UNITS 1 AND 2.
Directorate of Licensing (AEC), Washington,

Available from NTIS, Springfield, Va., as Rept. No. Docket 50440-61; \$10.60 per copy, \$1.45 microfiche. Report No Docket 50440-61 and 50441-61, April 1974. 394 p., 35 fig. 60 tab, 138 ref,

Descriptors: *Lake Erie, *Nuclear powerplants, Effluents, Environment, Administrative agencies, **Comprehensive planning, **Sites, Geology, Investigations, Hydrology, Seismology, Climatology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health, Transportation, Beneficial use, Cost-benefit analysis **Obis Transportation**. ysis, *Ohio. Identifiers: *Environmental impact statements,

*Boiling water reactors.

This final environmental statement was prepared in compliance with the National Environmental Policy Act and relates to the proposed construction of the Perry Nuclear Power Plant, Units 1 and 2. Environmental impacts are assessed and after consideration of alternatives an environmental benefit-cost summary was compiled. Environmental factors considered include climate, hydrology (surface water and ground water), ecology includ ing aquatic life, cooling-water supply and discharge, cooling towers, cooling lakes, spray ponds, radioactive chemical and sanitary wastes, amount of dissolved oxygen and toxic chemicals in effluent water. The conclusion is to issue con-struction permits for the facility subject to the following conditions: (1) Determine the importance of the site as a spawning and nursery ground for fish; (2) adequate control of iodine-131; (3) if necessary, make changes in the cooling systems to meet the needs of items 1 and 2: (4) correct any adverse environmental impacts resulting from con-struction. (Houser-ORNL) W74-07793

IRON-55 AND RUTHENIUM-103 AND -106 IN THE BRACKISH-WATER CLAM RANGIA CU-

National Marine Fisheries Service, Beaufort, N.C. D. A. Wolfe, and C. D. Jennings. In: Conf-710501-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee. p 783-790, (1971) 4 fig, 3 tab, 25 ref.

*Aquatic environment. *Radioactivity, *Radioisotopes, *Water pollution, **Clams, Water pollution sources, Nuclear explosions, Testing, Fallout, *North Carolina, Brackish water, Saline water, Iron, Ruthenium.

Identifiers: Trent River(N.C.), Neuse River(N.C.).

Rangia cuneata, an estuarine clam, was collected at 4- to 6-week intervals during 1965-1967 from several stations over a 40-mile length of the Trent

and Neuse Rivers in eastern North Carolina. The soft tissues were dried, ashed, and analyzed for gamma-emitting radioisotopes, Fe-55, stable Fe, and other elements. Both Ru-103 and Ru-106 were more concentrated in clams collected from downstream stations at higher salinities than in clams from low-salinity water. A similar distribution was observed for Fe-55. Ruthenium-103 appeared in Rangia withing two weeks after the third and fifth Chinese nuclear tests, and its retention was resolved into two rate functions, with apparent effective half-lives of 40 days and 7 days. (See also W74-07799) (Houser-ORNL) W74-07804

DETERMINATION OF THE FATE OF POLYNUCLEAR AROMATIC HYDROCARBONS IN NATURAL WATER SYSTEMS, Illinois Univ., Urbana. Dept. of Civil Engineering. P. R. McGinnes, and V. L. Snoeyink.

Available from the National Technical Informa-tion Service as PB-232 168, \$3.75 in paper copy, \$1.45 in microfiche. Illinois Water Resources Center, Urbana, Research Report No 80, March 1974. 60 p, 19 fig, 26 ref. OWRR A-045-ILL(1). 14-31-0001-3513.

Descriptors: *Pollutant identification, *Aromatic compounds, Gas chromatography, Trace ele-ments, *Analytical techniques.

ments, *Analytical techniques.
Identifiers: *Fate of pollutants, *Polynuclear aromatic hydrocarbons, *Photodecomposition, Trace organics, Carcinogens, Ultraviolet light, Benz-pyrene, Benzanthracene.

The polynuclear aromatic hydrocarbons, or PAH. are of current concern as water pollutants and potential health hazards. The presence of PAH in natural water systems was evaluated and an analytical technique for specific PAH was developed. It was found that the PAH are not soluble in water but they either are present as particulate material or as material absorbed on solid surfaces in natural water systems. The photodecom-position of two PAH, 1,2 benzanthracene, or BA, and 3,4 benzpyrene, or BP, was examined. Both compounds decompose under ultraviolet light to form their quinones, which then further decom-pose. Both BP and BA decompose following first order kinetics in true solution in 20 percent acetone in water. Particulate BA also decompose following first order reaction kinetics, although particulate BP will decompose only to a depth of 0.2 micrometers before decomposition stops. This decomposition is relatively unaffected by water chemistry and will occur under solar radiation and in turbid waters. W74-07827

THE FATE AND EFFECTS OF PESTICIDES IN THE AQUATIC ENVIRONMENT OF THE FLATHEAD LAKE DRAINAGE AREA,

Montana Univ., Missoula. Dept. of Zoology. For primary bibliographic entry see Field 5C. W74-07835

DETERMINING A RECREATIONAL LAKE'S TOLERANCE FOR DEVELOPMENT AND USAGE, New Hampshire Univ., Durham. Water Resources

New Hampsnire Univ., Durham. Water Resources Research Center. R. H. Frey, and R. V. Fabian, Jr. Available from the National Technical Informa-tion Service as PB-232 246, \$3.25 in paper copy, \$1.45 in microfiche. Completion Report, January 1974. 22 p. 3 tab, 12 ref. OWRR A-032-NH(1). 14-31-0001-3829.

Descriptors: *Water quality, *Water pollution, *Lakes, *Limnology, Sampling, Surface waters, Aquatic algae, Light penetration, Deep-water habitats, Plankton, Anabaena, *New Hampshire, Cyanophyta, Recreational facilities, Management, *Vatural recreases

Natural resources. Identifiers: *Squam Lake(N.H.).

Group 5A-Identification Of Pollutants

Information is needed with respect to the tolerable levels of development, chemical inputs, bacteria and organic materials that a lake basin can withstand before water quality is impaired, to provide the basis for regulations that will foster the maintenance of high lake water quality and natural surrounding. The current level of pollutants, or the water quality, must be determined and monitored. In 1972, a three-year project was undertaken to help solve the problems of Squam Lake, New Hampshire and provide an approach for coping with similar pressures on other recreational waters. During the first phase of this project (summer, 1972), data on the water quality of the lake were obtained with respect to light penetration, temperature, dissolved, exverse total tion, temperature, dissolved oxygen, total phosphates, nitrates and total coliform. The status of the lake was examined in terms of species diver-sity of plankton, using the Shannon-Weiner diversity index. During the second phase of this project (summer, 1973), sources of pollution and contamination were located by a systematic method of water analysis. As sources were located, this in-formation was given to the respective town health officers who in turn continued the investigation to eliminate the sources of pollution. (Wakefield-New Hampshire) W74-07836

SURVIVAL OF ENTERIC PATHOGENS AND INDICATOR ORGANISMS IN NATURAL

WATERS, Tennessee Univ., Knoxville. Dept. of Civil En-

ineering.

J. D. Womack, P. B. O'Connor, and P. Williams. Available from the National Technical Information Service as PB-232 242, \$3.75 in paper copy, \$1.45 in microfiche. Tennessee Water Resources Research Center, Knoxville, Research Report No 25, November 1973. 46 p, 7 fig, 28 ref. OWRR A-014-TENN(2). 14-31-0001-3243.

Descriptors: *Salmonella, Bacteria, Microorgan-isms, Enteric bacteria, Pathogenic bacteria, *Tennessee, Pollutant identification, Coliforms, Cytological studies, Cultures, Bioindicators, Microbiology.
Identifiers: Ft. Loudoun Reservoir(Tenn).

This report deals with (1) various microbiological methods to positively quantify Salmonella, fecal coliforms and standard coliforms (2) confirmation studies of bacteria growing on Bismuth Sulfite Agar and (3) diffusion cell studies of the survival characteristics of Salmonella bacteria in Fort Lou-doun Reservoir. The difficulties encountered in confirming the presence of pathogenic Salmonella in mixed cultures prevented accurate quantification. This was due to similar cultural characteristics of other enteric organisms. Alternative procedure employing diffusion cells excluded the interfering organisms and permitted useful mea-surements of environmental effects on pure cultures of pathogenic Salmonella.

COLIFORMS ARE AN INADEQUATE INDEX OF WATER QUALITY,

Canada Centre for Inland Waters, Burlington (Ontario).

Journal of Environmental Health, Vol 36, No 1, p 39-46, July/August, 1973. 2 fig, 6 tab, 31 ref.

*Water quality, Descriptors: Groundwater, *Coliforms, Aquatic life, Aquatic microorganisms, *Bacteria, *Enteric bacteria, Microbiology, *Pathogenic bacteria, Salmonella.

Identifiers: Shigella, Vibrio, Mycobacterium, Pasteurella, Leptospira.

Coliforms have been used as indicators of water quality for over 50 years. The presence of these organisms in water was assumed to indicate a potential health hazard because of their association in the intestine with a variety of pathogenic microor-

ganisms: Salmonella, Shigella, Vibrio, Mycobacgatisms. Samoleila, Singella, Vilorio, Mycous-terium, Pasteurella, Leptospira and enteric viruses. However, research in the last ten years has shown that coliforms do not fulfill any of the following criteria for indicator organisms: be present and occur in much greater numbers than the pathogens concerned; not be able to proliferate to any greater extent than enteric pathogens in the aqueous environment; be more resistant to disinfectants and to the aqueous environment than the pathogens; yield characteristic and simple reactions enabling as far as possible an unambiguous identification of the group. Coliforms are reviewed with respect to the above criteria, and more practical indicators of water quality are suggested for use in the future. (Campbell-NWWA) W74-07885

COLLECTION, DETECTION, IDENTIFICA-TION, AND QUANTITATION OF HUMAN EF-FLUENTS, Edgewood Arsenal, Aberdeen Proving Ground,

R. I. Ellin, R. L. Farrand, F. W. Crouse, and N. B.

Available from NTIS, Springfield, Va., 22151, as AD-768 762. Price \$3.00 printed copy; \$1.45 microfiche. Biomedical Laboratory Technical Report EB-TR-73007 (EATER 4799), October 1973. 25 p, 8 fig, 3 tab, 8 ref.

Descriptors: *Pollutant identification. *Chemical analysis, *Chromatography, Gas chromatography, Mass spectrometry, *Domestic wastes. Identifiers: Human wastes.

Over 135 compounds were identified in human wastes. Two to three times this number of compounds were observed in the sensitive gas chro-matograph-mass spectrometer (GC-MS) analytical system, but could not be identified. A variety of organic structures are included among these effluents. In addition to alcohols and ketones, unsaturated, branched, cyclic and aromatic hydrocarbons, sulfhydryl and cyano and a variety of heterocyclic compounds were found. Porous polymer collectors can be used to collect effluents at room temperature, to absorb more effluents in a shorter time, can be connected in parallel, and can be cleaned and desorbed without using vacuum. (Knapp-USGS)

FOAM FRACTIONATION OF MERCURY(II) NITRO COMPLEXES.

National Lead Co., Hightstown, N.J. M. W. Miller, and G. L. Sullivan. Separation Science, Vol 6, No 4, p 553-558, August, 1971. I tab, 1 fig, 7 ref.

Descriptors: *Foam fractionation, *Ion exchange, *Distribution patterns, *Mercury, Analytical techniques, Separation techniques, Foam separation, Nitrogen compounds, Acids, Chemical reactions, Surfactants, Laboratory tests, Measure-ments, Evaluation, Cations. Identifiers: Nitric acid.

The cationic surfactant hexadecyltrimethyl ammonium bromide (HDT) was used to determine the distribution factor for mercury(II) as a function of the normality of nitric acid. The application of ion exchange data to the removal of mercury(II) nitro complexes by foam fractionation is also reported. Results of tests indicated that the distribution factor of mercury(II) nitro complexes is strongly pendent on the HNO3 acid concentration, with the maximum occurring at approximately 0.1M nitric acid; HDT forms an ion pair with the Hg(NO3)3(-) complex and at 0.1M the fraction of mercury(II) ion in the Hg (NO3)3(-) form is presumably at a maximum. The magnitude of the stability constant has a greater effect on the value of the anion exchange volume distribution coefficient than on the foam fractionation distribution factor. The correct nitric acid concentration for removal of one or

more metal ions in nitro complex form can be determined from the ion exchange volume distribution factor maxima reported by Ichikawa et al (1961). Foam fractionation is an effective method for removal of trace amounts of complexes which form soluble ion pairs with a surfactant. (Jerome-Vanderbilt) W74-07945

SOME NOVEL COMPLEXES OF CHROMI-

UM(I), Leeds, Univ. (England). Dept. of Inorganic and Structural Chemistry. P. Gans, and S. M. E. Hague.

Chemistry and Industry, No 24, p 978, December 16, 1972, 1 tab. 3 ref.

Descriptors: *Chromium, *Metals, *Pollutant identification, *Heavy metals, Laboratory tests, Analytical techniques, Infrared radiation, Oxida-

Identifiers: *Infrared spectroscopy.

It has been reported previously that the hexaarylisocyanide complexes of chromium(0) exhibit three infrared-active C-N stretching bands rather than the single band expected of an octahedral complex (Cotton, F.A. and Zingales, F., 1961). Now, it has been found that the band at highest frequency, e. 2 2065(pm is not present in the presenfrequency, ca 2 065/cm, is not present in the spectra of carefully purified samples, but bands at the appropriate frequencies appear when the solutions of the pure compounds are exposed to air. Compounds in which the band at ca 2065 cm is the most intense infrared band have subsequently been prepared by controlled oxidation of the chromium(O) compounds, and the preparation and properties of the phenyl isocyanide derivatives are described. Symmetry and activity of the C-N stretching vibrations are described, together with similar magnetic, conductivity and spectroscopic results obtained with other isocyanide compounds (Oleszkiewicz-Vanderbilt) W74-07946

URANIUM, THORIUM, AND LEAD CONCEN-TRATIONS IN THREE SILICATE STANDARDS AND A METHOD OF LEAD ISOTOPIC ANALY-

Geological Survey, Denver, Colo. For primary bibliographic entry see Field 2K. W74-07947

AN INSTRUMENTAL TECHNIQUE FOR THE DETERMINATION OF SUB-MICROGRAM CONCENTRATIONS OF MERCURY IN SOILS, ROCKS, AND GAS,

Geological Survey, Denver, Colo. For primary bibliographic entry see Field 2K. W74-07948

DETERMINATION OF MERCURY IN VEGETA-TION WITH DITHIZONE - A SINGLE EXTRAC-

TION WITH DITHIZONE - A SINGLE EATROCTION PROCEDURE, Geological Survey, Denver, Colo. F. N. Ward, and J. B. McHugh. Professional Paper 501-D, Geological Survey Research, p D128-D130, 1964, 2 tab, 7 ref.

Descriptors: *Spectrophotometry, *Mercury, *Extraction, *Vegetation, Analysis, Chemical analysis, Analytical techniques, Instrumentation, Testing, Sampling, Testing, identification, Plants. Methodology, Pollutant

spectrophotometric method for determining small amounts of mercury in vegetation is based on the reaction of mercury with dithizone after sample dissolution by wet ignition under reflex. Treatment of the sample solution with sulfur dioxide provides a reducing environment during the formation and extraction of the mercury dithizonate into n-hexane. Thus, a single extraction suffices to obviate side reactions, and double

Identification Of Pollutants-Group 5A

extractions or reversion steps are unnecessary.

The method is useful for determining as little as 0.4 ppm of mercury in dry vegetation, and this range is enough to evaluate the usefulness of the mercury content of vegetation (Oleszkiewicz-Vanderbilt) is prospecting. W74-07949

ODORS EMITTED FROM RAW DIGESTED SEWAGE SLUDGE, Saint Louis Metropolitan Sewer District, Mo. AND For primary bibliographic entry see Field 5D.

GRADIENT ANALYSIS OF CARBON MONOX-IDE AND METHANE IN POLLUTED AND OTHER NEARSHORE HABITATS.

Naval Postgraduate School, Monterey, Calif J. T. Welch.

Available from the National Technical Informa-\$\text{State}\$ in microfiche. Thesis, March 1973. 84 p. 19 fig, 11 tab, 17 ref, 3 append.

Descriptors: *Analytical techniques, *Gases, *Methane, *Sea water, Gas chromatography, California, Tracers, Sewage effluents, Air-water interfaces, Computer programs.
Identifiers: *Carbon mono monoxide, Monterey

Bay(Calif.).

Two concepts were tested in Monterey Bay, California. (1) That carbon monoxide production might be related to primary productivity and (2) since methane gas, reported as present in surface waters, is a product of anaerobic decomposition of organic matter, it might be useful as a pollution tracer from sewage outfalls. The highly sensitive methods of gas chromatography were used and are described. Results from an open ocean station and several nearshore stations show a possible correla-tion between carbon monoxide and primary productivity. Methane was shown to be present in the upper 100 m, with a maximum at about 50 m. At nearshore stations, concentrations of methane and carbon monoxide were both far above equilibrium and open ocean values. Methane con-centrations were highest in the vicinity of sewage centrations were highest in the vicinity of sewage outfalls and the source of this gas may be the city water supply. Carbon monoxide concentrations may be dependent on the type of plant life in the surrounding waters. Transects showed that methane was an effective tracer for sewage disposal plant effluent and that kelp seemed to slow pollutant diffusion and mixing. Results indicate the state of the search is executive to the search of the search is search of the search of t dicate that, at least locally, the ocean is a source of carbon monoxide and methane in the atmosphere. (Jones-Wisconsin)

THEORY AND APPLICATION OF CONTINU-OUS MONITORING FOR CHEMICAL RESEARCH IN NATURAL WATER SYSTEMS, G. K. Rice, and L. P. Varga. Available from the National Technical Informa-

tion Service as ORD-4254-8, \$3.25 in paper copy, \$1.45 in microfiche. Atomic Energy Commission ORD-4254-8, October 1972. 24 p. 2 tab, 56 ref.

Descriptors: *Measurement, *Data collections, **Chemical properties, *Water quality, Mathematical studies, Biological properties, Kinetics, Aqueous solutions, Analytical techniques, Equipment, Automation, Monitoring.

Identifiers: Inorganic mass balance.

Natural water monitoring can be divided into two categories: pollution detection and basic research. Pollution monitoring measures parameters that can determine water quality while monitoring for basic research collects data useful for determining the composition and nature of a water system. Continuous monitoring requires that methods for measuring be instrumented and then automated to produce continuous data accurately for extended periods of time. Pollution monitors typically emphasize physical parameters because these are easiest to monitor. Some physical measurements are required for chemical research including water temperature and consideration that biological and chemical systems are non-separable. Biological and chemical systems are non-separable. Biological processes are difficult to represent mathematically, and significant progress in this area has been made only recently. Regarding kinetic factors. whether or not an equilibrium model will adequately describe chemistry of natural waters depends on how closely steady state conditions are approached. Of all analytical methods, colorimetry and potentiometry are most commonly adapted for continuous monitoring in natural waters. In selecting methods for a specific analysis, their suitability for continuous monitoring under field conditions has to be evaluated. Methods, recording, data processing, and display are discussed. (Jones-Wisconsin) W74-07985

INVESTIGATION OF RIVER WATER FOR THE PRESENCE OF ESCHERICHIA COLI AND ENTEROCOCCUS, (IN RUSSIAN),

Municipal Sanitary-Epidemiological Leningrad (USSR). A. G. Kapkova, L. I. Karaseva, and V. A.

Avdeeva.

Gig Sanit. Vol 37, No 3, p 100-101. 1972.

Identifiers: *Enterococcus, *E. coli, *Alkalinity,

*Polymyxin, *River waters, Antibiotics, Pollutant

Determination of the presence of E. coli and enterococci in river water was carried out on an enrichment alkaline polymyxin medium. This medium has selectivity due to alkalinity (pH 9.6-10.2) and ability of the antibiotic polymyxin to suppress gram-negative flora, particularly E. coli. The confirming medium was 1 with methyl violet for final suppression of gram-negative microflora, except enterococci.--Copyright 1973, Biological Ab-

POLLUTION MONITORING IN LAKE CHAM-PLAIN USING ERTS-1 IMAGERY,

Vermont Univ., Burlington. Remote Sensing Lab. A. O. Lind, and E. B. Henson.

Available from the National Technical Informa-tion Service as N73-26347 \$3.00 in paper copy, \$1.45 in microfiche. Report June 1973. 7 p, 4 fig. NAS 5-21753

Descriptors: *Pulp wastes, *Water pollution sources, *Monitoring, *Satellites(Artificial), Vermont, New York, Surveys, Spectrophotometry, Sedimentation, Judicial decisions. Identifiers: *Lake Champlain(Vt.-N.Y.), ERTS-1

imagery, Poderoga(N.Y.). Pollution plume,

The detection of a major pollution plume emanating from the International Paper Company's Fort Ticonderoga operation is described. plume was seen in the Earth Resources Technology Satellite (ERTS) coverage of October 10, and it was observed that the plume configuration agreed with earlier lake surveys. Position of the plume in with earlier late surveys. Fostion on the plume the lake may be determined by superimposing MSS bands 4 and 6 or 7. The near-infrared band provides excellent shoreline definition and makes it possible to note the extent of the plume area. The usual high level of general turbidity in the water shows as a light tone in the image compared to the darker tone of the plume area which results from the suspended paper mill wastes producing an overall brownish coloration. The cumulative effect of these images will be to provide data to con-struct a model depicting the plume configuration in differing seasons and limnological conditions. This information can be combined with aircraft data taken under different circumstances. The documented plume data will be made available to the Vermont Attorney's Office for possible application in the ongoing resources action now in progress at U.S. Supreme Court level. (Jones-W74-08009

SANITARY-HYGIENIC EVALUATION OF THE WATER QUALITY OF THE NURA WATER CONDUIT OF THE TSELINOGRAD DISTRICT

Meditsinskii Institut, Tselinograd (USSR).

Meditsinskii Institut, 1seinograd (USSK).
N. M. Anan'ev, and N. A. Demin.
Gig Sanit, Vol 37, No 10, p 92-94, 1972.
Identifiers: Conduits, *Fluorine, Hygienic conditions, *Iron, Sanitary conditions, *USSR(Nura River), *Water quality standards, Alluvial

The water quality of the alluvial deposits of the Nura River (USSR) meets the requirements of the State standard, except for the high content of Fe (0.3-2 mg/l) and low content of F1 (0.08-0.4 mg/l). (0.3-2 mg); and tow content of F1 (0.8-0.4 mg)). Fluoridation plants should be installed at the intakes of the Nura water conduit and the metal pipes should be replaced by polyethylene, asbestos-cement, or other materials which would not affect water quality.—Copyright 1973, Biological absence in California (1.8-2). cal Abstracts, Inc. W74-08052

A SCANNING ELECTRON MICROSCOPIC STUDY OF SECONDARY LAMELLAE AND CHLORIDE CELLS OF RAINBOW TROUT (SALMO GAIRDNERI), Michigan State Univ., East Lansing. Dept. of

Physiology.

For primary bibliographic entry see Field 5C. W74-08096

INVESTIGATIONS ON THE PROBLEM OF SOLUBILITY AND STABILITY OF STEROID OVULATION INHIBITORS IN WATER, WASTE WATER AND ACTIVATED SLUDGE, (IN GER-

K. Norpoth, A. Nehrkorn, M. Kirchner, H. Holsen, and H. Teipel. Zentralbl Bakteriol Parasitenkd Infektionskr Hyg

Erste B Hyg Praev Med. Vol 156, No 6, p 500-511. 1973. Illus. English summary. Identifiers: *Activated sludge, *Inhibitors, Oral contraceptives, *Solubility, Stability, *Steroid ovulation, Waste water, Chromatography, Pollutant identification.

The solubility steroid ovulation inhibitors was determined in double distilled water and in various waste water samples using quantitative fluorospectroscopic steroid identification by thin layer chromatography. Further experiments were carried out to determine how long the individual synthetic progestagens and estrogens persist in activated sludge. Of oral contracepatives commercially available, ethinylestradiol had a water solubility of 4.75 mg/l; for the other steroids, the values were between 0.2 and 2.0 mg/l. In the waster test the steroid cobbility was constituted in water tests the steroid solubility was sometimes insignificantly and sometimes markedly reduced. In no case was the difference more than 50%. In activated sludge, the estrogens (ethinylestradiol, mestranol) persisted intact over 5 days, while the progestagens were more than 50% disintegrated after 48 hr. Stable decomposition products of megestrol acetate, medroxyprogesterone acetate, megestroi acetate, metroxyprogesterone acetate, norethisterone, chlormadinone acetate and norgestrel were still found after 5 days, but it was not possible to determine their biological activity. Ethinylestradiol, which is included as the estrogen component of almost all commercial preparations for oral contraception, is far more soluble in water than the other components of oral contraceptives and is probably excreted in greater quantities. The compound also persists in activated sludge for more than I week. Possible future dangers from the accumulation of synthetic steroid compounds in waste water are unpredictable.—Copyright 1973, Biological Abstracts, Inc. W74-08133

Group 5A-Identification Of Pollutants

DETERMINATION OF COUNTING EFFICIEN-CY BY 14C BY LIQUID SCINTILLATION IN PRIMARY PRODUCTION MEASUREMENTS IN A LAGOON ENVIRONMENT, (IN FRENCH). Univ. (Tunisia). Laboratoire

d'Oceanographie.

P. Crouzet.

Rev Int Oceanogr Med. 26, p 27-41. 1972, Illus.

(English summary).

Identifiers: "Carbon-14 method, Environment, Lagoons, Measurements, "Primary production, "Scintillation method, "Cytological studies, Solubility, Pollutant identification.

Liquid scintillation is known to be the easiest way of counting 14C in primary productivity measure-ments. Direct application of this technique to lagoons poses the problem of counting efficiency determination for non-homogeneous samples. The experiments presented suggest a partial solubiliza-tion of cells by organic solvent. The channel ratio method should be used for the correct determination of counting efficiency.--Copyright 1973, Biological Abstract, Inc. W74-08143

5B. Sources Of Pollution

IRRIGATION OF CITRUS WITH CITRUS WASTE WATER.

Florida Univ., Lake Alfred. Inst. of Food and Agricultural Sciences.

For primary bibliographic entry see Field 5D. W74-07603

ANALYSIS OF LIQUID-WASTE INJECTION WELLS IN ILLINOIS BY MATHEMATICAL

Illinois Univ., Urbana. Water Resources Center.
M. Heidari, K. Cartwright, and P. Saylor.

Available from the National Technical Information Service as PB-232 004, \$4.75 in paper copy, \$1.45 in microfiche. Research Report No 77, January 1974, 124 p, 34 fig, 4 tab, 48 ref. OWRR A-058-ILL(1). 14-31-0001-3813.

Descriptors: *Illinois, *Finite element analysis, *Equations, *Mathematical models, Flow, Dispersion, *Injection wells, Liquid wastes, Industrial

wastes, Diffusion, Path of pollutants.
Identifiers: *Mass-transport equation, *Flow equation, Multi-layered systems, Adaptive-Chebyshev-factorization method.

Results are presented of a preliminary theoretical study of the fate of liquid industrial wastes injected into deep geologic formations. The Jones and Laughlin Corporation well was used as a model and the geology of the area was idealized into a 15-layered homogeneous and anisotropic mathematical model. The finite element method was tested and proved to be an effective mathematical tool in the solution of the equation of flow. The flow and pressure build-up show that the rocks are capable of receiving greater volumes of waste than are now being injected without endangering the integrity of the aquifer or the confining layer. The mass-transport equation for large and complex ground-water reservoir systems was investigated, and it was concluded that the dispersion and diffusion parts of the equation are rela-tively insignificant, and under extreme conditions the dispersed zone will not be more than a few feet wide. Therefore, it was concluded that a more practical approach to the problem would be the solution of a system with a moving interface boundary in which mass transport results mainly from convection. To overcome difficulties encountered with computer time and memory in the solution of the mass-transport equation for large complex systems, an iterative method is proposed for the solution of the equations, which substantially reduces these difficulties. W74-07604

POLLUTED GROUNDWATER: SOME CAUSES. EFFECTS, CONTROLS, AND MONITORING. General Electric Co., Santa Barbara, Calif. Center for Advanced Studies.

Available from the National Technical Informa-tion Service as PB-232 117, \$6.75 in paper copy, \$1.45 in microfiche. Environmental Protection Agency, Monitoring Series, Report EPA-600/4-73-001b, July 1973. Edited by Charles F. Meyer. 282 p, 32 fig, 29 tab. EPA Contract 68-01-0759.

Descriptors: *Water pollution sources, *Water pollution effects, *Water pollution control, *Monitoring, *Underground waste disposal, Aquifer management, Federal Water Pollution Control Act, *Groundwater, Management, Water

Consultants Harvey O. Banks, James J. Geraghty, P.H. McGauhey, Nathaniel M. Perlmutter, David Keith Todd, and Don L. Warner, and TEMPO staff members Charles F. Meyer and Edward J. Tschupp, formed a team which prepared information for EPA's use in developing guidelines and re-ports in compliance with the Federal Water Pollution Control Act Amendments of 1972. Ground-water pollution aspects of the following topics are discussed: institutional and legal constraints; injection wells into saline and freshwater aquifers; lagoons, basins, and pits; septic systems; sewer leakage; spraying; land fills; surface-groundwater relationships; saltwater intrusion; land subsidence and collapse; effects of urbanization and of flow diversion, including wells and surface structures; spills of liquid pollutants; tank and pipeline leakage; and groundwater basin management, including related surface activities. (See also W74-07614) (EPA) W74-07615

EFFECT OF DEICING CHEMICALS ON GROUND AND SURFACE WATER--(MODUS OPERANDI),

Geological Survey, Boston, Mass.

Available from the National Technical Informa-Available from the National Technical Information Service, Springfield, Va 22151, PB-222 290, Price \$3.00 printed copy; \$1.45 microfiche. Research Project R-18-1, Interim Progress Report for Massachusetts Department of Public Works, December 1972. 31 p, 20 fig, 3 tab.

Descriptors: *Path of pollutants, *Deicers, *Massachusetts, Chlorides, Sodium, Salinity, Water pollution sources, Water pollution effects, Snow removal, Highways, Monitoring.

Transport of highway deicing chemicals by surface water and groundwater is related to a variety of geologic, hydrologic and highway maintenance conditions. A number of study sites in Mas-sachusetts were selected for collection of data. Eight steamflow sites were instrumented to measure the surface runoff of deicing salt. At each of three groundwater sites, 14 or more wells were installed to monitor the movement of salt in the ground. Criteria, besides small drainage area, for selecting a site to monitor included that there be little interference from sources of salt other than highway deicing chemicals, that highways are located in the basin and that the amount of salt applied could be obtained and measured. (Knapp-USGS) W74-07617

NITROGEN TRANSFORMATIONS IN SOIL DURING LEACHING: I. THEORETICAL CON-SIDERATIONS,

California Univ., Davis. Dept. of Water Science and Engineering. C. Misra, D. R. Nielsen, and J. W. Biggar.

Soil Science Society of America Proceedings, Vol 38, No 2, p 289-293, March-April 1974, 12 ref.

Descriptors: *Nitrification, *Denitrification, *Leaching, *Unsaturated flow, Ammonia, Oxida-

tion, Soil water movement, Diffusion, Path of pollutants, Equations, Reduction(Chemical)

Transport equations describing the movement and simultaneous oxidation of NH4 to NO3 and reduction of NO3 and N2 by microbial and chemical means were set up and solved both for leaching of a pulse and for a continuous application at the soil surface. Both ionic adsorption owing to cation exchange and microbiological transformations were considered and distinguished as reversible and irreversible processes, respectively. The possibilities of the model extended to a sequential transformation during transport of more than two nitrogen species have been examined. (See also W74-07620 and W74-07621) (Knapp-USGS) W74-07619

NITROGEN TRANSFORMATION IN SOIL DUR-ING LEACHING: II. STEADY STATE NITRIFI-CATION AND NITRATE REDUCTION. California Univ., Davis. Dept. of Water Science

and Engineering. C. Misra, D. R. Nielsen, and J. W. Biggar.

Soil Science Society of America Proceedings, Vol 38, No 2, p 294-299, March-April 1974. 5 fig, 1 tab,

Descriptors: *Nitrification, *Denitrification, *Leaching, *Unsaturated flow, Ammonia, Oxidation, Soil water movement, Diffusion, Path of pollutants, Equations, Reduction(Chemical).

Nitrogen transformations were examined by means of a miscible displacement technique that permitted passage of air with different levels of oxygen through the soil. With the use of steadystate solutions of equations describing the convec-tive transport of NH4 and NO3 ions in Columbia silt loam, first-order reaction rate constants k1 and k2 were ascertained for NH4-oxidation and NO3-reduction, respectively. Values of k1 were 10-fold greater than those of k2. At an oxygen level of 0.5% in the gaseous phase, nitrification was ap-parently inhibited. (See also W74-07619) (Knapp-USGS) W74-07620

NITROGEN TRANSFORMATIONS IN SOIL DURING LEACHING: III. NITRATE REDUCTION IN SOIL COLUMNS, California Univ., Davis. Dept. of Water Science

and Engineering.
C. Misra, D. R. Nielsen, and J. W. Biggar.
Soil Science Society of America Proceedings, Vol
38, No 2, p 300-304, March-April 1974. 7 fig, 1 tab,

Descriptors: *Nitrification, *Denitrification. *Leaching, *Unsaturated flow, Ammonia, Oxida-*Nitrification. *Denitrification. tion, Soil water movement, Diffusion, Path of pollutants, Equations, Reduction(Chemical).

Nitrate reduction in water-unsaturated Columbia silt loam columns was examined at 19.5C and 34.5C with three levels of oxygen (0.5%, 5%, and 20%) in an aerating gas passing through Following a continuous application of NH4 solution, a pulse of a NO3 solution was leached through the columns. After the decay of the pulse, a continuous application of NO3 solution allowed mathematical analysis leading to ascertaining NO3 reduction rate coefficients. The temperature dependence of these constants as a function of ox-ygen composition and the need for microbial population and activity analysis are discussed. (See also W74-07619) (Knapp-USGS) W74-07621

DISTRIBUTION OF FREE IRON AND OR-GANIC CARBON AS RELATED TO AVAILA-BLE WATER IN SOME FORESTED SANDY SOILS,

Michigan Technological Univ., L'Anse. Ford Forestry Center. For primary bibliographic entry see Field 2G.

Sources Of Pollution-Group 5B

W74-07622

NITROGEN TRANSFORMATIONS DURING CONTINUOUS LEACHING,

California Univ., Davis. Dept. of Soils and Plant Nutrition.

J. L. Starr, F. E. Broadbent, and D. R. Nielsen. Soil Science Society of America Proceedings, Vol 38, No 2, p 283-289, March-April 1974. 9 fig, 17

*Nitrification, Descriptors: *Nitrification, *Denitrification, *Leaching, *Unsaturated flow, Ammonia, Oxidation, Soil water movement, Diffusion, Path of pollutants, Equations, Reduction(Chemical).

Simultaneous nitrification, denitrification, and N movement were investigated in a soil column during continuous unsaturated leaching. During a con-tinuous application of NH4Cl solution, analyses were made of the soil solution with soil depth and time for N as NH4, NO2 and NO3; and of the soil atmosphere for O2, CO2, N2O, and N2. The use of N-15 permitted direct measurement and quantification of nitrification and denitrification, as well as the transport of N in the liquid and gaseous phases. Solutions to the appropriate equations using measured reaction rate coefficients, pore-water velocities, and diffusion coefficients adequately described the steady state NH4 and NO3 concentration distribution in the soil profile. Equations were also used to stoichiometrically account for the various interacting species in the N transformations. (Knapp-USGS) W74-07623

BIODEGRADATION OF NITRILOTRIACETATE (NTA) IN SOILS, Michigan State Univ., East Lansing. Dept. of Crop and Soil Sciences

J. M. Tiedje, and B. B. Mason. Soil Science Society of America Proceedings, Vol 38, No 2, p 278-283, March-April 1974. 3 fig, 5 tab,

*Nitrilotriacetic *Biodegradation, *Path of pollutants, Chelation, Carbon radioisotopes, Detergents, Sewage Carbon disposal, Sludge, Activated sludge, Sewage treat-ment, Soil disposal fields, Tracers. Identifiers: *Land disposal(Wastes).

Nitrilotriacetate (NTA) was biodegraded in a variety of soils; the process was measured by total CO2 and CO2 production from C-14-carboxyl-NTA. Production of CO2 and C-14 followed NIA. Production of CO2 and C-14 followed similar patterns and suggested complete degrada-tion of NTA; C-14 production was used routinely to assay NTA dissimilation. At 40 ppm of NTA in soils receiving sewage effluent and in muck soils, maximum rates of degradation were 8 to 10 ppm/day while in mineral surface soils, they ranged from 0.5 to 6 ppm/day; the rates in subsoils were always less than for the surface soils from the same site. Degradation rates did not correlate with pH, drainage, texture, or plant cover. Rates of degradation increased from 2 to 64 ppm/day as NTA concentration was increased from 10 to 600 ppm. C-14 production from NTA did not occur anaerobically and was severely limited under microaerophilic conditions. NTA was degraded at 24 and 12.5C; it was also degraded at 2C if previ-ously acclimatized at 12.5C. Iminodiacetate was a possible intermediate in NTA degradation while N-methyliminodiacetate was not. (Knapp-USGS)

A KINETIC STUDY OF AMMONIUM AND NITRITE OXIDATION IN A SOIL FIELD PLOT, California Univ., Berkeley. Dept. of Soils and

Plant Nutrition. M. S. Ardakani, R. K. Schulz, and A. D. McLaren. Soil Science Society of America Proceedings, Vol 38, No 2, p 273-277, March-April 1974. 6 fig, 1 tab, 13 ref. NSF RANN GI-34733XI. Descriptors: *Oxidation. *Ammonia. *Nitrates. Soils, Nitrification, Denitrification, Soil microorganisms, Adsorption, Biodegradation. Identifiers: Nitrobacter, Nitrosomonas.

Disappearance of NH4 from percolating solution in a field test was attributed to both oxidation and to adsorption by the soil. Once a steady state was established and exchangeable NH4 was equilibrated with NH4 in soil solution, oxidation alone accounted for disappearance of NH4 in the top 2.5 cm of the soil. Concentration profiles of NO2 and NO3 may be described by a modified Michaelis-Menten equation. Rate constants for oxidation of NO2 and NH4 are 0.0006 and 0.0025, respectively. These rates are in good agreement with the values found under controlled laboratory conditions. Growth and distribution in soil of Nitrobacter and Nitrosomonas were followed by weekly estimates of their numbers at different depths. Nitrobacter reached a maximum popula-tion of about 1 million per cc of soil but declined to a stable density of about 100,000 organisms per cc. Nitrobacter approached a steady level of about 10,000 organisms per cc. Both organisms showed higher densities near the soil surface where the concentrations of substrates were always highest. (Knapp-USGS) W74-07625

OF MONOSILICIC ACID EFFECT HYDROLYTIC REACTIONS OF ALUMINUM, Saskatchewan Univ., Saskatoon. Inst. of Pedolo-

gy. For primary bibliographic entry see Field 2G.

ADSORPTION OF FENURON AND MONURON (SUBSTITUTED UREAS) BY TWO MONT-MORILLONITE CLAYS.

Louvain Univ. (Belgium). Dept. of Soil Science. R. Van Bladel, and A. Moreale. Soil Science Society of America Proceedings, Vol 38, No 2, p 244-249, March-April 1974. 5 fig. 4 tab,

Descriptors: *Adsorption, *Herbicides, *Clay minerals, Bentonite, *Montmorillonite, Urea pesticides, Thermodynamics, Monuron, *Path of pollutants, Chemical degradation.

The effect of the type of clay mineral, exchangeable cation, temperature, and electrolyte concentration on the adsorption of two substituted ureas was investigated. Adsorption was greater on a bentonite than on a Camp Berteau montmorillonite because the lattice charge in the bentonite originates from tetrahedral and octahedral layers, whereas in the montmorillonite the charge originates only from octahedral layers. The adsorption increased with the polarizing power of the exchangeable cation. Normal adsorption isotherms were exothermic but when the temperature effect on solubility was accounted for, the ad-sorption reaction tended to be more and more temperature independent as the electronegativity of the exchangeable cation increased. Ther-modynamic data suggest that the favorable contribution to the adsorption energy arises mainly from enthalpy changes. The effect of salt concen-tration was almost negligible up to 1.0N and for a given electrolyte good agreement was obtained between the heat of solution of the herbicide and its adsorption. (Knapp-USGS) W74-07627

THE SURFACE CATALYZED HYDROLYSIS OF

PARATHION ON KAOLINITE, Agricultural Research Organization, Dagan(Israel). Inst. of Soils and Water. S. Saltzman, B. Yaron, and U. Mingelgrin. Soil Science Society of America Proceedings, Vol 38, No 2, p 231-234, March-April 1974. 5 fig, 13 Descriptors: *Kaolinite, *Catalysts, *Hydrolysis, *Organophosphorus pesticides. Pesticide residues. Pesticide kinetics, Chemical degrada-Identifiers: *Parathion.

The decomposition of parathion on various monoionic kaolinites proceeds via the hydrolysis of the phosphate ester to p-nitrophenol and diethyl thiophosphate. The kaolinites catalyze the hydrolysis. The nature of the exchangeable cation greatly affects the rate of hydrolysis. Ca-kaolinite is the most active in inducing the degradation of parathion, the hydrolysis being twice as fast as in a water solution at pH 8.5 at the same temperature. The presence of a large excess of water decreases catalytic effect of the kaolinite. The mechanism of the hydrolysis is via adsorption of the parathion upon the exchangeable cation or its the parathion upon the exchangeable cation or its hydration shell. The temperature dependence of the process is consistent with this proposed mechanism. The significant catalytic activity of kaolinites and its dependence on the exchangeable cation is important to the degradation of parathion in soil and may be utilized in the formulation of parathion for various purposes. (Knapp-USGS) W74-07628

FIXATION OF ZINC BY CLAY MINERALS, Georgia Agricultural Experiment Station, Athens. For primary bibliographic entry see Field 2G. W74-07629

PACKING-INDUCED RADIAL PARTICLE-SIZE RATING-SIZE SEGREGATION: INFLUENCE ON HYDRODYNAMIC DISPERSION AND WATER TRANSFER MEASUREMENTS, Geological Survey, Menlo Park, Calif. For primary bibliographic entry see Field 2G. W74-07630

ANION EXCLUSION AND COUPLING EF-FECTS IN NONSTEADY TRANSPORT THROUGH UNSATURATED SOILS: II. LABORATORY AND NUMERICAL EXPERI-

Agricultural Research Organization, Bet-Dagan (Israel). Dept. of Soil Physics. For primary bibliographic entry see Field 2G. W74-07631

ANION ADSORPTION BY ALLOPHANIC TROPICAL SOILS: I. CHLORIDE ADSORP-

California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering.
For primary bibliographic entry see Field 2G. W74-07634

ANION ADSORPTION BY ALLOPHANIC TROPICAL SOILS: II. SULFATE ADSORP-

California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering. For primary bibliographic entry see Field 2G. W74-07635

ANION ADSORPTION BY ALLOPHANIC TROPICAL SOILS: III. PHOSPHATE ADSORP-

California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering. For primary bibliographic entry see Field 2G. W74-07636

WELLS AND PUMPING SYSTEMS FOR DOMESTIC WATER SUPPLIES, Illinois State Water Survey, Urbana. For primary bibliographic entry see Field 8B.

Group 5B-Sources Of Pollution

ESTIMATION OF IMPERVIOUSNESS AND SPECIFIC CURB LENGTH FOR FORECAST-ING STORMWATER QUALITY AND QUANTI-

Metropolitan Washington Council of Governments, Washington, D.C. Dept. of Health and Environmental Protection.

White Pollution Control Federation, Vol 46, No 4, p 717-725, April 1974. 5 fig. 4 tab, 14 ref.

Descriptors: *Mathematical models, *Urban hydrology, *Storm runoff, *Permeability, *Water quality, Infiltration, Storm water, Urban runoff, Biochemical oxygen demand, Cities, Water pollution sources. Urban drainage. Identifiers: Imperviousness.

A method is given for estimating the imperviousness and specific curb length (curb length per unit area) of a watershed for input into a storm-water model. A sensitivity analysis was used to establish the importance of these parameters on the quantity and quality of stormwater runoff. Methods are presented to obtain specific curb length and imperviousness values from color in-frared imagery. The functional relationships with household, population, and employment densities are reported. With the ability to infer imperviousness and specific curb length from demographic data commonly projected by planners, it is now convenient for the environmental engineer to make estimates of future urban runoff volume per storm and BOD washoff per storm in expanding urban areas. (Knapp-USGS) W74-07640

USE OF FLUORESCENT DYE TRACERS IN

MOBILE BAY, Food and Drug Administration, Dauphin Island, Ala. Gulf Coast Technical Services Unit A. H. Story, R. M. McPhearson, Jr., and J. L.

Journal Water Pollution Control Federation, Vol 46, No 4, p 657-665, April 1974. 4 fig, 1 tab, 19 ref.

Descriptors: *Path of pollutants, *Bays, *Estuaries, Tracers, *Dye releases, Tides, Currents(Water), *Alabama, Fluorescent Tracking techniques. Identifiers: *Mobile Bay(Ala).

Surveys of shellfish growing areas in Mobile Bay included a study of the effects of tides and stream-flows on pollutants. Fluorescent dyes were used to trace movement of water masses. The approximate minimum time for pollutants to travel from the Mobile River (Source of pollutants) to the south end of the bay where the oyster reefs are situated was determined. Dve was introduced at high tide and at flood stage in the river and was fol-lowed until it reached the oyster reefs. The minimum time for water to pass through the bay was calculated to be 56 hr. (Knapp-USGS) W74-07642

CHESTER RIVER STUDY, VOLUMES I, II, AND III. Chester River Study Joint Investigation by State

of Maryland Department of Natural Resources and Westinghouse Electric Corporation, November 1972 (Vols 1, 38p, and II, 251p) and July 1973 (Vol III, 107p).

Descriptors: *Polychlorinated biphenyls, *Water pollution sources, *Water pollution effects, *Path of pollutants, *Maryland, Rivers, Erosion, Chesapeake Bay, Estuaries, Pesticides, Sedimentation, Trace elements, Shellfish.
Identifiers: *Chester River(Md).

Shellfish and finfish from the Chester River, Maryland, are presently safe for human consumption with respect to concentrations of hard chlorinated hydrocarbon type insecticides and polychlorinated biphenyls (PCB's). The insecti-

cides, DDT, DDD, DDE, chlordane, and PCB's (primarily Aroclor 1242) were found routinely in biological samples and sediment samples from the Chester River, but at levels far below those considered hazardous to humans. Most of the measured chlorinated hydrocarbon pollutants are en-tering the Chester River from the upper Bay rather than from the river drainage area itself. Both trace metals and the insecticides and PCB's are carried on the surfaces of sediments, there being an inverse relationship between the amount of these materials and the mean grain-size of the sediments. Shoreline erosion is extensive in the lower Chester River. Significant amounts of shore erosion are caused by water seepage and runoff from the landward side. Volume I is an overview of the entire study, presenting in a condensed form the scope and major findings. Volume II contains the discipline-oriented reports upon which the con-tents of Volume I are based. Volume II is organized into eight sections. Section 1 gives a description of the Chester River region; section 2 covers the investigations of pesticides and PCB's; section 3 takes up the trace metals investigated during the Chester River Study; section 4 discusses the biological investigations; section 5 covers the geological investigations; section 6 presents the findings of the meteorological and hydrological investigations; and section 7 covers the data management techniques. Section 8 discusses instrumentation and equipment. Volume III contains the data for the discipline-oriented reports. (See W74-07654 thru W74-07660) (Knapp-USGS) W74-07653

BIOCHEMICAL INVESTIGATIONS,

T.O. Munson.
In: Chester River Study, Volume II; Joint Investigation by State of Maryland Department of Natural Resources and Westinghouse Electric Corporation, p 15-45, November 1972. 19 fig, 10

Descriptors: *Polychlorinated biphenyls, *Water pollution sources, *Water pollution effects, *Path of pollutants, *Maryland, Rivers, Erosion, Chesapeake Bay, Estuaries, Pesticides, Sedimentation, Trace elements, Shellfish. Identifiers: *Chester River(Md).

The sediments and biota of the Chester River, Maryland, were analyzed for chlorinated hydrocarbons on a seasonal basis and found to contain DDT (DDD and DDE), chlordane and PCB's (mostly of the Aroclor 1242 variety). None of the compounds found in the biota occurred at levels high enough to be considered potentially hazardous to human health. The chlorinated hydrocarbons appeared to be entering the Chester River from the Bay rather than coming from sources within the Chester River watershed. Toxicity experiments indicated that the shellfish readily accumulated chlordane to high levels from very low concentrations in the water. Even though the observed levels in Chester River shellfish presented no hazard to human health, the levels may be high enough to adversely affect the animals themselves. In addition, the toxicity data provided an understanding of the chlordane uptake mechanisms for soft-shelled clams and oysters which may yield useful resource manage-ment tools. (See also W74-07653) (Knapp-USGS) W74-07654

TRACE METALS INVESTIGATIONS. Westinghouse Electric Corp., Pittsburgh, Pa. H. D. Palmer.

In: Chester River Study, Volume II; Joint Investigation by State of Maryland Department of Natural Resources and Westinghouse Electric Corporation, p 47-59, November 1972. 2 fig. 6 tab,

*Trace elements, *Estuaries, Descriptors: Maryland, Bottom sediments, Zinc, Lead, Cadmium, Copper, Chromium, Iron, Heavy metals, Path of pollutants, Water pollution sources, Chesapeake Bay.
Identifiers: *Chester River(Md).

Bottom sediment samples from the Chester River Estuary, Maryland, were analyzed to determine concentration levels of six metallic ions (Zn, Pb, Cd. Cu. Cr. and Fe). High concentrations of these metals were found at the mouth of the river and in the upper tributary portions of the Chester River. Low values for these metals were found in the middle reaches of the river upstream from the mouth but downstream from the major tributary net. A strong negative correlation exists between trace metal concentrations and the mean grain size of sediments, but only weak correlations are found between trace metals and the clay mineralogy of sediments. Concentrations of zinc are higher than those reported for other similar estuaries in the Chesapeake Bay region, but all trace metal concentrations are below levels of environmental concern. Dredging of the fine-grained materials in the main channel of the river, however, could be hazardous to the environment, since it would place large amounts of these materials back in suspension. (See also W74-07653) (Knapp-USGS)

BIOLOGICAL INVESTIGATIONS,

J. M. Forns.

J. M. Forns.
In: Chester River Study, Volume II; Joint Investigation by State of Maryland Department of Natural Resources and Westinghouse Electric Corporation, p 61-73, November 1972. 5 fig, 6 tab,

Descriptors: *Plankton, *Estuaries, *Maryland, Chesapeake Bay, Sampling, Water pollution ef-fects, Chlorinated hydrocarbon pesticides. Identifiers: *Chester River(Md).

A preliminary investigation of the zooplanktonic community was undertaken as part of the study of the distribution and movements of chlorinated hydrocarbons through the aquatic environment of the Chester River System, Maryland. The chlorinated hydrocarbon concentrations in any one of the plankton samples could not have exceeded 0.286 ppm. Four planktonic groups were present plus a great deal of organic detrital matter. The overwhelmingly dominant organism in the planktonic community during the time of year investigated (October 1972) was the copepod Acartia tonsa. Comparisons of all tows at the three stations did not indicate any significant differences in the vertical distribution of plankters from surface to bottom or changes in community structure from the mouth of the river to the farthest station upstream. However, a slight increase in the numbers of Acartia copedodite stages was observed at the station closest to the Bay while nauplii seemed more abundant at the upstream station. Generally, the relative percent composition of the different organisms in the 20 collections examined were quite similar to those observed in other northeastern estuaries such as Long Island Sound, Raritan Bay and Delaware Bay. (See also W74-07653) (Knapp-USGS) W74-07656

GEOLOGICAL INVESTIGATIONS, Westinghouse Electric Corp., Pittsburgh, Pa. H. D. Palmer.

In: Chester River Study, Volume II; Joint Investigation by State of Maryland Department of Natural Resources and Westinghouse Electric Corporation, p 75-137, November 1972. 47 fig, 5 tab, 99 ref.

*Sedimentation, *Estuaries. Descriptors: *Maryland, Sediment transport, Provenance, Geology, Mineralogy, Stratified flow, Sediment load, Suspended load, Bed load, Erosion, Bank erosion, Stream erosion. Identifiers: *Chester River(Md).

Sources Of Pollution—Group 5B

The chemical, physical, and microbiological characteristics of typical bath and laundry waste

The Chester River, Maryland, is similar to many rivers entering Chesapeake Bay in that extensive portions of its lower reaches are now drowned by the geologically recent rise in sea level. It is, therefore, capable of receiving sediments from the Bay as well as furnishing them. Sediments accumulating in the Chester River estuary are derived from shoreline erosion, from the adjacent Bay, and from the tributary net of the drainage basin. In the lower reaches of the river, Bay and shoreline sediment sources predominate, but in upstream areas, the primary sources are shoreline erosion and from the tributaries. Sedimentation is occurring in two clastic wedges prograding to the south. The upstream wedge is accumulating materials re-worked from the extensive blanket deposits formed by the Upland terrace sands, silts and clays, while the downstream wedge, lying at the mouth of the river, is being built by an influx of Bay sediments supplemented by local shoreline erosion. A series of thalweg basins lie between the two wedges, and low sedimentation rates in them indicate a bypassing mechanism is partially responsible for maintaining these features. Two-and occassionally three-layer flows were measured. Net transport into the river from the Bay prevails in the lower layer, and clay mineralogy of both bottom and suspended sediment indicates that the fine fractions originating outside the river are being deposited at least 22 miles upstream from the mouth. (See also W74-07653) (Knapp-USGS) W74-07657

METEOROLOGICAL AND HYDROLOGICAL INVESTIGATIONS,

K. T. S. Tzou.

In: Chester River Study, Volume II: Joint Investigation by State of Maryland Department of Natural Resources and Westinghouse Electric Corporation, p 139-211, November 1972. 45 fig, 11 tab, 24 ref.

Descriptors: *Meteorology, *Hydrology, *Estuaries, *Maryland, Currents(Water), Winds, Sediment transport, Path of pollutants, Chlorinated hydrocarbon pesticides, Streamflow, Discharge(Water), Precipitation(Atmospheric), Hydrographs.

Identifiers: *Chester River(Md).

Meteorological and hydrological investigations were undertaken to gain an understanding of possible transport mechanisms for chlorinated hydrocarbons (pesticides and PCB's) in the Chester River system of Maryland. Field measurements included air temperature, precipitation, wind speed and direction, streamflow, tides, current speed and direction, water temperature, salinity (conductivity), dissolved oxygen and pH. Water movements in the upper Bay are largely responsible for the transport of these materials. The coupling of meteorological and hydrological processes are also important in the final distribution of sediments carrying the chlorinated hydrocarbons. Prevailing winds in the Chester River area are from west to northwest in the spring, fall and winter and from the southwest during the summer. Hence, pesticide residues from the western shore of the Bay can be carried directly by winds and reach the study area through aerial fallout. Attachment of chlorinated hydrocarbons to particulate matter is the most important transport mechanism, particularly in the movetransport merchanism, particularly in the move-ment of fine sediments carrying the chlorinated hydrocarbons from the Bay to the River. About 28 grams of PCB's, 3 grams of total DDT and 1 gram of chlordane were moving into the Chester River from the Bay each day during the early spring freshet period, and only a small fraction of these compounds were returned to the Bay in late spring. Most of the chlorinated hydrocarbons found in the Chester River sediments originate in Chesapeake Bay. Meteorological conditions and their strong coupling with the hydrological regime have contributed to serious shore erosion in various portions of the River. Tropical storm 'Agnes' demonstrated in a dramatic fashion how strongly these factors are interlocked. Extreme low salinities as a result of this storm caused losses of shellfish, particularly the soft-shelled clam, while record annual high water levels were recorded at several points in the river. (See also W74-07653) W74-07658

DATA MANAGEMENT,

R. W. Onstenk.
In: Chester River Study, Volume II; Joint Investigation by State of Maryland Department of Natural Resources and Westinghouse Electric Corporation, p 213-235, November 1972. 14 fig, 6 tab. 2 ref.

Descriptors: *Data processing, *Data storage and retrieval, Meteorological data, Hydrologic data, Estuaries, Maryland, Water pollution, Water quality.

Identifiers: *Chester River(Md).

The nature of the Chester River study required the collection, storage and analysis of more than 30 million data. Wind speed and direction, tide, currents, and various physical and chemical observations regarding temperature, conductivity, dissolved oxygen and pH were fundamental measurements which required analysis. Field data from a variety of sensors employing magnetic tape, paper tape, hand entries on log sheets, and card decks and tapes from participating agencies all required registration to a common time base prior to their storage in a master data file. Details of data handling and problems encountered in the management of large quantities of diverse information are presented. (See also W74-07653) (Knapp-USGS) W74-07659

EQUIPMENT AND INSTRUMENTATION,

A. G. Haury.

In: Chester River Study, Volume II; Joint Investigation by State of Maryland Department of Natural Resources and Westinghouse Electric Corporation, p 237-251, November 1972. 15 fig, 12 tab.

Descriptors: *Estuaries, *Maryland, *Data collections, *Instrumentation, Streamflow, Currents(Water), Rain gages, Meteorological data, Hydrologic data, Sampling, Sediments.

Instrumentation and complementary equipment required in support of the 12-month study of the Chester River, Maryland, are described. Performance of the various devices is discussed, with a description of problems, calibration techniques, and installation schemes employed for hydrological and meteorological sensors. Major problems encountered during the study included vandalism and severe biological fouling during summer months when the rise in water temperature prompted growth of algae and slime on submerged instruments. (See also W74-07653) (Knapp-USGS) W74-07660

THE CHEMICAL/PHYSICAL AND MICROBIOLOGICAL CHARACTERISTICS OF TYPICAL BATH AND LAUNDRY WASTE WATERS,

National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center. W. D. Hypes, C. E. Batten, and J. R. Wilkins. Available from NTIS, Springfield, Va 22151 NASA TN D-7566 Price \$3.00 printed copy; \$1.45 microfiche. Technical Note D-7566, March 1974. 29 p. 4 fig, 8 tab, 6 ref.

Descriptors: *Water reuse, *Domestic water, Water quality, Coliforms, Turbidity, Water chemistry, Waste water(Pollution), Water pollution effects.

Identifiers: Bath water, Laundry water.

waters were studied. Data are presented for bath waste water and laundry waste water collected separately and for bath and laundry waste water collected together during a 12-day test in which the untreated waste waters were reused for toilet flush water. The characteristics of combined bath and laundry waste waters showing the most significant changes from a tap water were ammonia, color, methylene blue active substance (MBAS), phosphates, sodium, sulfates, total organic carbon, total solids, and turbidity. The mean total number of microorganisms detected from the combined bath and laundry waste waters ranged from 1 to 10 million cells/ml and the mean number of possible coliforms ranged from 100,000 to 1 million cells/ml, respectively. An accumulation of particulates and an objectionable odor were detected in the tankage use during the 12-day reuse of the untreated waste waters. The combined bath and laundry waste waters from a family of four provided enough water for 91 percent of the toilet flushing of the same family. (Knapp-USGS)

QUALITY OF SURFACE WATERS IN THE COLORADO RIVER BASIN, TEXAS, 1966-72 WATER YEARS,

Geological Survey, Austin, Tex. J. Rawson, M. L. Maderak, and L. S. Hughes. Open-file report, February 1974. 81 p, 8 fig, 7 tab, 11 ref.

Descriptors: *Water quality, *Texas, *Rivers, Path of pollutants, Salinity, Saline water, Water pollution sources.
Identifiers: *Colorado River basin(Tex).

The discharge-weighted average concentrations of dissolved solids in flow from the San Saba, Llano, and Pedernales Rivers of Texas during the 1966-72 water years were less that 250 mg/liter dissolved solids, 50 mg/liter chloride, and 50 mg/liter dissolved solids, 50 mg/liter chloride, and 50 mg/liter sulfate. Saline-water inflow seriously degraded the quality of water in the Colorado River upstream from Colorado City and in most of the principal tributaries upstream from San Saba. The discharge-weighted average concentration of dissolved solids was about 1,110 mg/liter in flow of the Colorado River at Colorado City. Inflow of water from Pecan Bayou, San Saba River, Llano River, Pedernales River, and several smaller tributaries caused a progressive reduction in the concentrations of dissolved constituents in the Colorado River downstream from the areas of saline inflow. The discharge-weighted average concentrations for flow in the lower reach of the Colorado River between Austin and Wharton were less than 300 mg/liter dissolved solids. Diversion of saltwater upstream from Colorado City has reduced the salinity of the water available for storage in E. V. Spence Reservoir. Inflow of organic wastes caused some localized degradation in the quality of water in tributaries but caused no serious impairment in the quality of water in the main stem between San Saba and Wharton. The discharge of wastes containing minor elements or the use of pesticides in the areas studied has not resulted in serious impairment of the quality of the water. (Knapp-USGS)

HETEROGENEITIES IN SALINITY IN A RIVER

PLUME, Delaware Univ., Newark. Coll. of Marine Studies. For primary bibliographic entry see Field 2L. W74-07672

A SIMPLE, SEGMENTED PRISM MODEL OF TIDAL MIXING IN WELL-MIXED ESTUARIES, Institute of Oceanographic Sciences, Taunton (England). For primary bibliographic entry see Field 2L.

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W74-07673

CHEMICAL EVIDENCE FOR THE DISPERSAL OF RIVER MERSEY RUN-OFF IN LIVERPOOL

Liverpool Univ. (England). Dept. of Oceanog-

raphy.
M. I. Abdullah, and L. G. Royle.
Estuarine and Coastal Marine Science, Vol 1, No 4, p 401-409, October 1973. 3 fig, 2 tab, 20 ref.

Descriptors: *Water circulation, *Path of pollu-tants, Tracers, Bays, Estuaries, Currents(Water), Trace elements, Water chemistry, Tides. Identifiers: *United Kingdom(Liverpool Bay).

River Mersey water was traced in Liverpool Bay by analysis of chemical data (nutrients and some trace metals) for surface water obtained in December 1970 and March 1971. The extent of the December 1970 and March 1971. The extent of the area and the rate of dispersal of Mersey effluent is mainly controlled by the turbulent mixing caused by meteorological conditions as well as tidal effects. (Knapp-USGS)
W74-07674

A SIMILARITY SOLUTION FOR STEADY-STATE GRAVITATIONAL CIRCULATION IN

Washington Univ., Seattle. Dept. of Oceanography.

For primary bibliographic entry see Field 2L. W74-07675

THE 7-DAY 10-YEAR LOW FLOWS OF IL-LINOIS STREAMS, Illinois State Water Survey, Urbana.

For primary bibliographic entry see Field 2E. W74-07677

MERCURY IN THE ENVIRONMENT, AN EPIDEMIOLOGICAL AND TOXICOLOGICAL

APPRAISAL.
For primary bibliographic entry see Field 5C.

TRANSPORT AND TRANSFORMATION OF MERCURY IN NATURE AND POSSIBLE ROUTES OF EXPOSURE,

Rochester Univ., N.Y. Dept. of Pharmacology and Toxicology.

In: Mercury in the Environment, (Chemical Rubber Co. Press), p 15-27, 1972, 1 tab.

Descriptors: *Path of pollutants, *Mercury, *Transfer, *Inorganic compounds, *Organic compounds, Water pollution, Air pollution, Geology, Industrial wastes, Chemical reactions, Biochemistry, Evaporation, Solubility, Food chains.

The sources of mercury and its transport in the air and aquatic environments and through food chains are discussed. Mercury occurs in nature to the extent of 50 to 80 ppb of the earth's content. It enters the geochemical cycle in the form of metallic mer-cury vapors and volatile or soluble mercury compounds. The physicochemical properties of newly formed compounds may contribute considerably to the release of mercury into the biosphere, since their high volatility and solubility make the transport of mercury into the environment easy. The natural content of mercury in surface waters depends of the accessibility of mercury, time of contact, and conditions of the water. Most of the mercury produced annually is eventually released to the environment through industrial and agricultural routes. All components of the biosphere contain at least minimal traces of mercury and constitute potential sources of exposure for all living organisms. Levels of mercury in the atmosphere and hydrosphere and routes of mercury passage through aquatic and terrestrial food chains are considered. Fish have been found to be the most important source of methylmercury in human food, however relatively high levels may occur in foods other than fish. (See also W74-07680) (Jerome-Vanderbilt)

METABOLISM,

Karolinska Institutet, Stockholm (Sweden), Dept. of Environmental Hygiene.
G. F. Nordberg, and S. Skerfving.
In: Mercury in the Environment, (Chemical

Rubber Co. Press), p 29-91, 1972, 2 fig, 8 tab.

*Mercury, Absorption, *Transfer, Water pollution, Air pollution, *Path of pollutants, Environmental effects, Human physiology, Human pathology, Animal physiology, Animal pathology, Biochemistry, Organic compounds, Inorganic compounds, Respira-tion, Laboratory tests, Evaluation, Reviews.

Mercury and its organic and inorganic compounds are considered in regard to their absorption into the human or animal body, their biotransformation and transport, their distribution in body tissue, their retention and excretion, and the indices of exposure to and retention of them. Absorption of mercury into the body is discussed in regard to respiratory intake, gastrointestinal uptake, skin absorption, and placental transfer, for elemental absorption, and placental transfer, for elemental mercury, inorganic mercury, and general and alkylmercury, aryl mercury, alkoxylkalkyl mercury and other organic mercury compounds. Oxidation of mercury is its major biotransformation. Elemental mercury is generally transported by the erythrocytes and penetrates biological membranes easily. Mercury compounds are concentrated mainly in the kidney, liver and brain tissue. The biological half-life of inorganic mercury in humans is 30 to 60 days, and for alkylmercury compounds it appears to be longer. The rate of elimination of organic mercury compounds depends upon the rate of degradation into inorganic mercury. The most reli-able index of exposure to and retention of mercury in the nervous system is the level of mercury in the blood. (See also W74-07680) (Jerome-Vanderbilt) W74-07683

'NORMAL' CONCENTRATIONS OF MERCURY IN HUMAN TISSUE AND URINE, National Swedish Food Administration, Stockholm. Dept. of Nutrition and Food Hygiene. For primary bibliographic entry see Field 5C. W74-07685

GENERAL DISCUSSION AND CONCLUSIONS-NEED FOR FURTHER RESEARCH,

Karolinska Institute, Stockholm (Sweden). Dept. of Environmental Hygiene. For primary bibliographic entry see Field 5C. W74-07689

METALS FOCUS SHIFTS TO CADMIUM, H. M. Miller.

Environmental Science and Technology, Vol 5, No 9, p 754-755, Sept. 1971. 1 fig, 1 tab.

Descriptors: *Metals, *Cadmium, *Human disease, *Research priorities, Pollutants, Air pollu-tion, Water pollution, Environmental effects, Tox-icity, Investigations, Path of pollutants, Absorp-tion, Distribution, Water pollution sources.

A link between cadmium and osteomalacia has led to concern over the amount of this metal in the environment. Cadmium has an extermely long biological half-life and, although rare in the earth's crust, it does not degrade in the environment. This metal has been linked to serious liver and kidney damage, pulmonary disease and death, in addition to brittleness of bones. The Environmental Protection Agency commissioned several studies to determine the cadmium threat to health, and results seem to show that it is not as great as with mercury contamination. Although nearly 4.6 million pounds were emitted into the atmosphere in alone, the levels in ambient air are not seen as significant. Only about 5% of ingested cadmium is retained by the body while up to 40% of inhaled cadmium is retained. Most cadmium in the environment results from metallurgical processing or incineration of plastic products. (Jerome-Van-W74-07697

AERIAL POLLUTION AND THE RAPID EVOLUTION OF COPPER TOLERANCE, Liverpool Univ. (England). Dept. of Botany. L. Wu, and A. D. Bradshaw

Nature, Vol 238, No 5360, p 167-169, July 21, 1972. 3 fig, 1 tab, 10 ref.

Descriptors: *Industrial wastes. *Soil contamination, *Copper, *Plant growth, Biology, Biochemistry, Metabolism, Growth rates, Pollution, Fallout, Toxins, Soil analysis, Heavy metals, Zinc, Lead, Inhibitors, Plant physiology.

Although airborne metals have been shown to be toxic to plants when they contaminate soil, it was noted that Agrostis stolonifera and Agrostis tenuis growth covered contaminated soil after ten years or more. This study investigated the rapid evolu-tion of copper tolerance in these species. Seeds from plants in areas of copper contamination were taken and their growth was compared with that of seeds from uncontaminated soil, and seeds from soil which was contaminated with zinc and lead, when they were all grown in soil from a copper refining area which contained 10,260 ppm copper. The seeds from plants in areas of no copper con-tamination grew very poorly, and most of the seedlings died, while seeds from copper contaminated areas grew normally. Metal tolerance seems to be selective, but, selection for copper tolerance appears to occur easily. (Jerome-Vanderbilt) W74-07713

HYDROGEOLOGIC INVESTIGATION OF A SANITARY LANDFILL IN STRATIFIED GLA-CIAL DRIFT, Connecticut Univ., Storrs. Inst. of Water

T I Holzer

Available from the National Technical Information Service as PB-232 154, \$3.00 in paper copy, \$1.45 in microfiche. Completion Report, 1973. 12 p, 7 fig, 1 tab. OWRR A-038-CONN(1). 14-31-0001-3207.

Descriptors: *Landfills. *Glacial *Groundwater movement, *Water pollution sources, Hydrogeology, *Connecticut, Path of pollutants, Water table, Ions, *Chlorides, Dispollutants, W solved solids.

The impact on quality of ground water beneath a municipal sanitary landfill in fine-grained, rhythmically-bedded glacial drift in eastern Connecticut was investigated over a sixteen-month period. Two wells drilled through the landfill yielded water samples of natural quality. Chemical analyses of ground water for selected dissolved inorganic constituents (total Fe, Ca++, Mg++, Na+, K+, HCO3-, SO4=, and C1-) indicate sig-nificant contamination of shallow ground water only in the immediate vicinity of the landfill. The distribution of these constituents is in general agreement with predictions based on the map of the water table. Anomalous, but low, concentra-tions of C1- were detected, approximately 2,100 feet from the landfill in the direction of groundwater flow. This distance agrees with estimated rates of horizontal migration, 70-100 feet per year, and the age of the landfill, 30 years. However, pollution by road salting or septic tanks also may be the source of the C1. Concentrations of leachate in shallow ground water beneath the landfill corre-

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late with seasonal fluctuations of the water table, with high concentrations corresponding to periods when the water table is above the base of the landfill

W74-07728

THE TRANSPORT OF RADIOISOTOPES BY FINE PARTICULATE MATTER IN AQUIFERS. Georgia Inst. of Tech., Atlanta. Environmental Resources Center.

J. B. F. Champlin.

Available from the National Technical Informa-tion Service as PB-232 179, \$5.50 in paper copy, \$1.45 in microfiche. Report No WRC-1169, December 1969, 187 p, 27 fig, 8 tab, 97 ref. OWRR A-002-GA(5). 14-01-0001-1629.

Descriptors: *Radioisotopes, *Water pollution sources, *Aquifers, Fallout, *Radioactive wastes, Soil physical properties, Soil chemistry, Bound water, Adsorption, Clay minerals, *Path of pollu-

Identifiers: Particle retention, *Van der Waals

Information on the long-term movement of radioactive fission products and other pollutants from waste pits, fallout, and underground nuclear explosions is persued through theoretical and experimental investigations of the various perimental investigations of the various phenomena that pertain to ion transport or reten-tion by soils. The theoretical section explores the interactions between solids in water that result from thermal forces, electrostatic charges, and van der Waals forces. The particle range considered is that of the large colloid to the finest silt. Special attention is given to sources of energy sufficient to cause breakage of adsorption bonds, ad-ditive bonding, and the relationshp between suspended particles and the granules making up the aquifer. The experimental section explores factors which influence either retention of radioactivity by the sand bed or transport of the activity through such a bed by micro-particles. Correlation between the phenomena observed experimentally and those predicted in the theoretical section shows Casimir's correction to the theoreti-cal van der Waals interactions to account for major changes in the particle retention ability of a sand bed. Control of the movement of radioactivity through porous soils lies first with the nature of the particles, second with the cation and anion concentrations of the suspending solutions, and third with pore size distribution of the aquifer. (See also W72-06571) (James-Georgia Tech) W74-07730

CHARACTERIZATION OF SUSPENDED SEDI-MENTS IN WATER FROM SELECTED WATERSHEDS AS RELATED TO CONTROL PROCESSES, NUTRIENT CONTENTS, AND LAKE EUTROPHICATION, Washington State Univ., Pullman. Dept. of

Agronomy and Soils.
B. L. Carlile, B. L. McNeal, J. A. Kittrick, L. C.

Johnson, and H. H. Cheng.

Available from the National Technical Informa-Strong Service as PB-232 176, \$4.00 in paper copy, \$1.45 in microfiche. Completion Report, March 1974, 92 p. 30 tab, 52 ref. OWRR A-052-WASH(1). 14-31-0001-3548.

Descriptors: *Suspended solids, *Sediments, Nitrogen, Phosphorus, Flocculents, Adsorption, Creek Muds, *Return flows, Erosion, Turbidity, Settling ponds, *Nutrients, Eutrophication, Water pollution control, *Washington, Irrigation, *Path

Laboratory and field investigations characterized suspended sediments from watersheds of varied hydrologic, soil and land use characteristics. Agricultural activities in the dryland wheat region of eastern Washington contributed large amounts of sediments and dissolved nitrogen during heavy runoff periods, whereas urban activities provided

substantial nitrogen and phosphorus during the remaining months. Chemical 'fingerprints' suggested that most suspended solids originated from actively-eroding agricultural fields, rather than from channel erosion. In excess of 90 per cent of the orthophosphate exposed to sediments was ad-sorbed, with adsorption following the Freundlich sorbed, with adsorption tollowing the Freuducin isotherm and being essentially non temperature-dependent. Chemical analyses of creek muds above and below two sewage treatment plants substantiated the existence of interactions between muds and effluents. In irrigated portions of the Yakima Valley, furrow irrigation management had a significant effect on sediment and nutrient con-tents or irrigation return flows, with sediment concentrations substantially higher than permitted by proposed water quality standards. Preliminary field assessment was provided of sediment removal by settling ponds, and preliminary laboratory studies demonstrated the superiority of ca-tionic flocculents. Nutrient contents of sediments from better-managed fields were higher in several cases, due to higher soil fertility levels. Correla-tion between suspended solids and turbidity were acceptable at loads between 20 and 300 mg/l, providing that data were grouped by location and season. Re-analysis of stored water samples demonstrated that equilibrium had existed initially between adsorbed and dissolved orthophosphate and ammonium nitrogen. W74-07736

SURVIVAL OF INTESTINAL BACTERIA IN OLIGOTROPHIC WATERS, Washington State Univ., Pullman. Dept. of Civil

For primary bibliographic entry see Field 5C. W74-07737

ACCUMULATION PHENOMENON WHICH TAKES PLACE IN A MUSSEL (MYTILUS GAL-LOPROVINCIALIS LMK) GROWN IN AN AR-LOPROVINCIALIS LMK) GROWN IN AN ARTIFICIALLY POLLUTED ENVIRONMENT, VERIFICATION OF A SIMPLIFIED MODEL OF THE DYNAMIC EQUILIBRIUM OF METAL RIPARTITION BETWEEN MUSSELS AND SEAWATER, NOTE II-POLLUTION FROM COPPER, (FENOMENO DI ACCUMULO NEL MITILO (MYTILUS GALLOPROVINCIA-LIS LMK) STABULATO IN AMBIENTE ARTIFICIALMENTE INQUINATO. VERIFICA DI UN MODELLO SEMPLIFICATO PER L'EQUILIBR IO DINAMICO DI RIPARTIZIONE DEL METALLI FRA MITILO E ACQUA MARINA. METALLI FRA MITILO E ACQUA MARINA, NOTA II: INQUINAMENTO DA RAME). For primary bibliographic entry see Field 5C. W74-07746

HYDRAULICS OF CULVERT OUTLETS, Auckland Univ., (New Zealand). Dept. of Civil Engineering. For primary bibliographic entry see Field 8B.

CONTRIBUTION TO WATER POLLUTION FROM AGRICULTURAL AND URBAN SOURCES IN THE COACHELLA VALLEY, California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering. J. J. Oertli, and G. R. Bradford. California Agriculture, Vol 27, No 7, p 4-6, July,

Descriptors: *California, *On-site data collections, Water pollution sources, *Urban runoff, *Agricultural runoff, Chemical properties, Effluents, Nutrients, Nitrogen, Investigations, Phosphorus, Salinity, *Surface runoff, Subsurface waters, Drainage water, *Water quality control. Identifiers: *Coachella Valley(Calif).

To obtain quantitative data on the contributions of agricultural and urban sources to water pollution, an investigation was initiated in the Coachella Valley on the chemical composition of drainage water from cropped fields under various agricultural managements and the effluents from the Indio sewage treatment plant. Research emphasis was on those nutrients suspected of playing a major role in eutrophication. Of the ten sampling station study fields, three were in citrus, two in grapes, one in dates, one in carrots, one in asparagus, two in corn. Surface runoff and subsurface drainage of a large feedyard were also sampled. Results indicate that the drainage water from corn, carrots, and asparagus fields contains the largest amounts of nitrates and that the most significant amounts of nitrates and that the most significant contributor to phosphates in the White Water River is the Indio sewage treatment plant. With respect to total salinity, the water quality was best from the sewage effluent and surface runoff from the feedyard. (Sandoski-Franklin)

INTERDISCIPLINARY MONITORING OF THE

NEW YORK BIGHT, Grumman Aerospace Corp., Bethpage, N.Y. For primary bibliographic entry see Field 5A.

TEST RESULTS ON BUOYANT JETS IN-JECTED HORIZONTALLY IN A CROSS FLOW-ING STREAM,

American Univ., Beirut (Lebanon). Faculty of Engineering and Architecture. or primary bibliographic entry see Field 8B. W74-07766

A NOTE CONCERNING THE ENVIRONMENTAL ACCEPTABILITY OF NITRILOTRIACETIC ACID (NTA): THE EFFECT OF NTA ON THE GROWTH OF GYMNODINIUM BREVE, University of South Florida, Tampa. Dept. of

Chemistry.

For primary bibliographic entry see Field 5C. W74-07775

W74-07780

SOIL MOISTURE TRANSPORT IN ARID SITE VADOSE ZONES, Atlantic Richfield Hanford Co., Richland, Wash. For primary bibliographic entry see Field 2G.

FRACTIONATION OF SUSPENDED AND COL-LOIDAL PARTICLES IN NATURAL WATER, Oak Ridge Gaseous Diffusion Plant, Tenn For primary bibliographic entry see Field 5A. W74-07783

TRITIUM DISTRIBUTION IN THE NUCLEAR INDUSTRY - THE REQUIREMENTS FOR CONTROL STRATEGIES,

Allied Chemical Corp., Idaho Falls, Idaho. Idaho Chemical Programs Operations Office.

B. C. Musgrave.

Available from NTIS, Springfield, Va., as Rept. No. ICP-1041; \$4.00 per copy, \$1.45 microfiche. Report No ICP-1041, January 1974. 23 p, 4 fig, 3 tab, 8 ref. AEC AT(10-1)-13755-22-1.

Descriptors: *Tritium, *Hydrogen, *Nuclear powerplants, *Air pollution, *Water pollution, *Water pollution sources, Radioisotopes, Control, Regulation, Safety, Evaluation, Assessment, Effluents, Waste storage, Waste disposal. Identifiers: *Fuel reprocessing.

Tritium which is produced from ternary fission in nrulear reactors will be diluted and dispersed throughout the aqueous streams in the fuel reprocessing plants. The ranges of tritium concen-trations expected in the reprocessing plant streams for different reactor types are examined. The requirements for tritium control through recycle isotope separation are described.

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economic study of these methods of control shows the costs are quite high. (Houser-ORNL) W74-07784

RADIOACTIVITY OF NEVADA HOT-SPRING

SYSTEMS, California Univ., Berkeley, Lawrence Berkeley

For primary bibliographic entry see Field 5A. W74-07786

THE TECHNOLOGY OF TRITIUM FIXATION

AND STORAGE, Battelle-Pacific Northwest Labs., Richland,

For primary bibliographic entry see Field 5D. W74-07789

URANIUM-234,

Atomizdat, Moscow (USSR).

V. V. Cherdyntsev.

John Wiley and Sons, Inc., New York, N.Y., 1971; 239 p, 43 fig, 77 tab, 1 biblio. \$19.50. Translation of URAN-234, Atomizdat, Moskva, 1969, by Israel Program for Scientific Translations, Ltd. 1971.

Descriptors: *Uranium, *Radioisotopes, *Natural resources, *Data collections, *Geochemistry, Nuclear energy, Radiation, Nuclear powerplants, Nuclear wastes, Water pollution, Oceans, Soils geology, Archeology, Radioactive dating, History, Quaternary period.

This book is a logical and systematic account of the experimental data available on uranium-234 in nature. The intention is not merely to review the experimental data in a systematic manner, but also to draw the attention of the experts in the various disciplines to the wide scope of application of U-234, which is an important and useful radioactive indicator, the atoms of which have been tagged by nature itself. Even now, U-234 is becoming one of the tools of modern nuclear geochemistry. Consideration is given to both the needs of specialists who will find that the experimental data contained in the tables are as complete and as up-to-date as in the tables are as complete and as up-to-date as feasible, and those readers interested in science in general and of workers in various historical and exact sciences: geologists, physicists, occanologists, vulcanologists, archeologists, soil scientists, etc. For the sake of the less specialized readers, technical terms with which believes to be seen to be see technical terms with which they may not be familiar are avoided, and to deal with physical problems in elementary physical terms, with geological problems in elementary geological terms, etc. Nevertheless, it is the purpose not merely to present facts but the totality of the ideas comprised in the subject of this book, without any simplification. (Houser-ORNL) W74-07790

ENVIRONMENTAL RADIOACTIVITY, New York Univ. Medical Center, N.Y. Inst. of Environmental Medicine.

M. Eisenbud.

Academic Press, New York, Environmental Sciences Interdisciplinary Monograph Series, 542 p. Second edition, 1973, 126 fig, 97 tab, 1 appen-dix, 1 bibliography, \$29.50.

Descriptors: *Environment, *Radioactivity, *Effluents, *Air pollution, *Water pollution, *Soil contamination, Regulation, Administrative agencies, Standards, Safety, Nuclear powerplants, Radioactive waste disposal, Transport, Transfer, Food chains, Biology, Public health, Fallout, Uranium, Training.

Identifiers: *Textbook.

A technical summary is presented of the relevant biological and physical information that has been accumulated in the 30 years since control over the fission process was first achieved. The text is concerned primarily with the behavior of radioactive substances when they enter the environment. Many of the diverse aspects of this behavior are reported. (Houser-ORNL)
W74-07791

ENVIRONMENTAL STATEMENT RELATED TO CONSTRUCTION AND OPERATION OF BARNWELL NUCLEAR FUEL PLANT.

Directorate of Licensing, Fuels and Materials (AEC), Washington, D.C.

Available from NTIS, Springfield, Va., as Rept. No. Docket 50332-37; \$7.60 per copy, \$1.45 microfiche. Report No Docket 50332-37, January 1974. 279 p, 12 fig, 29 tab, 3 append.

Descriptors: Fuels, *Nuclear powerplants, Effluents, Environment, Administrative agencies, *Comprehensive planning, *Sites, Geology, Investigations, Hydrology, Seismology, Climatoloyestigations, Hydrology, Seismology, Climatology, Meteorology, Ecology, Radioactive wastes, Water pollution, Water pollution sources, Radioactive effects, Monitoring, Public health Transportation, Beneficial use, Cost-benefit analysis, Krypton, Tritium, Iodine, *South Carolina. Identifiers: Identifiers: *Fuel reprocessing
*Environmental impact statements. plant,

This environmental statement was prepared in compliance with the National Environmental Policy Act and relates to the proposed continuation of construction permit of the Barnwell Nuclear Fuel Plant. The plant is located in Barnwell County, South Carolina, and will recover unused uranium and plutonium from irradiated nuclear fuels. Environmental impacts are assessed and after consideration of alternatives an environmental benefit cost summary was compiled. The conclusion is to continue the construction permit subject to specified environmental monitoring programs and recommendations for a course of action to alleviate any harmful effects or evidence of irreversible damage due to operation of the plant. (Houser-ORNL) W74-07792

FINAL ENVIRONMENTAL STATEMENT RE-LATED TO THE PROPOSED PERRY NUCLEAR POWER PLANT, UNITS 1 AND 2. Directorate of Licensing (AEC), Washington,

For primary bibliographic entry see Field 5A. W74-07793

IODINE-129 LEVELS IN MILK AND WATER NEAR A NUCLEAR FUEL REPROCESSING

York State Dept. of Health, Albany. Radiological Sciences Lab. J. C. Daly, S. Goodyear, C. J. Paperiello, and J. M. Matuszek

Health Physics, Vol 26, No 4, p 333-342, April 1974. 4 tab, 16 ref.

Descriptors: "Nuclear powerplants, Fuels, Effluents, Radioactivity, Iodine, "Milk, "Water pollution, Food chains, Water pollution sources, Measurement, Assay, Public health, Environment, Streams, "New York.
Identifiers: "Fuel reprocessing plant, Buttermilk

Creek(N.Y.).

Detection of substantial I-129 concentration in animal thyroids collected in the environs of a animal thyroids collected in the environs of a nuclear fuel reprocessing plant in West Valley, New York, signified a general buildup of I-129 in the environment surrounding the plant. Concern for a possible public health problem led to the development of a program to establish I-129 levels in milk and water in cooperation with the New York State Department of Environmental Conser-vation. Surveillance for I-129 in milk was begun in Sentember 1971. In a 12-month period the L129 September 1971. In a 12-month period the I-129 levels in 95 milk samples from farms surrounding the nuclear fuel reprocessing plant ranged from nondetectable (less than 0.3 pCi/1.) to 2 pCi/1. In

addition, 111 water samples collected between June 1971 and July 1972 from streams draining the plant site were analyzed for 1-129. Samples from Buttermilk Creek, which is on the plant site, showed I-129 concentrations up to 7.7 pCi/l. The impact of I-129 in the environment surrounding the plant is evaluated. Estimates of dose commitment paint is evaluated. Estimates of dose commitment are provided and are compared, for adults, to radiation protection guides. Recommendations are offered to reduce the potential public health hazard, principally by limiting the release of I-129 levels to the biosphere. (Houser-ORNL) W74-07798

RADIONUCLIDES IN ECOSYSTEMS, VOLUME

Oak Ridge National Lab., Tennessee For primary bibliographic entry see Field 5C. W74-07799

CONCENTRATIONS OF MANGANESE, IRON, AND ZINC IN JUVENILES OF FIVE ESTUARINE-DEPENDENT FISHES, National Marine Fisheries Service, Beaufort, N.C. For primary bibliographic entry see Field 5C.

TRACE-ELEMENT INTERACTIONS BETWEEN RIVER WATER AND SEAWATER.

Puerto Rico Nuclear Center, Mayaguez.

W. O. Forster, D. A. Wolfe, F. G. Lowman, and R. McClin.

In: Conf-710501-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee. p 807-815, (1971) 12 fig, 2

Descriptors: Rivers, Saline waters, *Trace elements, Tracers, *Radioactivity, Cobalt, Zinc, Iron, Manganese, Silver, Tin, Lead, Europium, *Radioisotopes, Mixing, Diffusion, Dispersion, Sediments, Absorption, Biota, Ion exchange, *Physics Biota. Puerto Rico. Identifiers: *Anasco River(P.R.).

The partitioning of several high-specific-activity radionuclides added to Anasco River water was studied as they mixed with various amounts of seawater. The distribution of selected biologically important radionuclides, Co-60, Zn-65, Fe-59, and Mn-54, was examined in their fractionation between the sediment, water, and biota, as well as the distribution for those which represented both soluble and insoluble trace elements, that is, Ag-110, Sn-113, Sb-125, and Eu-155. An effort was made to distinguise between the changes in distribution of these radionuclides due to biota by using replicate tracers with antibiotic added. In order to evaluate the intermediate-term chemical interactions of ions in seawater and river water, sediment-free water was used in selected experiments. The biogeochemical aspects of the above river water radionuclides in their mixing with seawater are discussed. (See also W74-07799) (Houser-ORNL) W74-07805

TRACE ELEMENTS IN MARINE SHRIMP.

Stanford Univ., Pacific Grove, Calif. Hopkins Marine Station.

For primary bibliographic entry see Field 5C. W74-07806

BIOLOGICAL HALF-LIVES FOR ZINC AND MERCURY IN THE PACIFIC OYSTER, CRAS-

SOSTREA GIGAS, Washington Univ., Seattle. Coll. of Fisheries. For primary bibliographic entry see Field 5C. W74-07807

A SYSTEMS ANALYSIS METHODOLOGY FOR PREDICTING DOSE TO MAN FROM A

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RADIOACTIVELY CONTAMINATED TER-RESTRIAL ENVIRONMENT, Oak Ridge National Lab., Tenn.

Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 5C. W74-07809

MODELING RADIONUCLIDES AND PESTI-CIDES IN FOOD CHAINS,

Battelle-Pacific Northwest Labs., Richland, Wash. Ecosystems Dept.

I. L. Eberhardt.

In: Conf-710501-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee, p 894-897, (1971) 1 fig, 11 ref.

Descriptors: "Systems analysis, Ecosystems, *Food chains, "Radioactivity, Pesticides, *Model studies, Insecticides, Cesium, Simulation analysis, Human population, Public health, Sampling, *Kinetics.

Some aspects of modeling the kinetics of trace substances in food chains are discussed. The problems of sampling in space, time, and 'systems' are considered in light of some case histories and a food-chain simulation model. (See also W74-07799) (Houser-ORNL) W74-07810.

ERROR ANALYSIS OF ECOLOGICAL MODELS.

Oak Ridge National Lab., Tenn.

R. V. O'Neill.

In: Conf-710501-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee. p 898-908, (1971) 4 fig, 4 tab, 11 ref.

Descriptors: *Systems analysis, *Simulation analysis, *Ecology, *Ecosystems, *Forecasting, Kinetics, Radioactivity, Model studies, Monte Carlo method, Mathematics, Statistical methods, Measurement.

Systems analysis techniques are valuable in the analysis of radionuclide kinetics in ecosystems. However, the art of systems modeling is relatively new to ecology, and few guides are available for constructing ecological models. As a result, untested hypotheses are sometimes involved in model development. For example, it may be difficult to predetermine optimal model complexity, that is, the number of state variables or compartments to be included in a model for acceptable accuracy. It could be argued that a more complicated model can account more accurately for complexi-ties in the real system. While this argument appears correct intuitively, additional factors need to be considered. The hypothesis that greater complexity leads to greater accurary was tested by analyzing the total uncertainty accompanying a model prediction. In general, systematic bias, resulting from abstracting the system into a few variables, is inversely related to complexity. However, there is a concomitant increase in uncertainity due to measurement effors on individual model parameters. As more parameters are added to the model, they must be quantified in field and laboratory experiments which are never error free. If these measurement errors are promulgated through a simulation, they contribute to uncertainty in model predictions. By applying Monte Carlo simulation techniques, it was possible to account explicitly for each component of the total uncertainty. Particular attention was paid to the balance between systematic bias and measurement errors. This analysis indicates that the gain in precision from increasing model complexity is not as consistent an outcome as might be expected. Results appear valid for a wide range of modeling applica-tions. (See also W74-07799) (Houser-ORNL) MATHEMATICAL MODEL OF TRITIATED AND STABLE WATER MOVEMENT IN AN OLD-FIELD ECOSYSTEM,

Puerto Rico Univ., Mayaguez. Dept. of Nuclear Engineering

D. S. Sasscer, C. F. Jordan, and J. R. Kline. In: Conf-710501-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee, p 915-923, (1971) 8 fig, 7 ref.

Descriptors: Water pollution, Soil contamination, *Tritium, *Model studies, Soil water, Cultivated lands, Simulation, Measurement, On site data collections, Equations, *Mathematical studies, Ecosystem,oil-water-plant relationships, Evapotranspiration, Diffusion, Percolation, Rainfall intensity, *Oil fields.

Water and tritium movement in an old-field ecosystem was simulated by means of a kinetic equation model utilizing data obtained from field measurements of stable and/or tritiated water. The ecosystem was assumed to consist of 49 layers of 1-cm-thick soil and one plant compartment. The water content of the soil and plants was described by a system of 50 simultaneous, first-order, linear, differential equations with discontinuous, variable coefficients. The coefficients were assumed to be functions of the evapotranspiration, Soil-water diffusion, gravity flow of soil water, and the previous 48-hr history of rainfall. A solution for the water content in each compartment as a function of time was arrived at by obtaining successive solutions of the system of differential equations for arbitrarily small periods of time during which the coefficients were assumed to be constant. A pulse of tritium deposited on or near the surface in the spring of the year is predicted to move downward in the soil to a depth of approximately 30 cm and remain there throughout the summer. Rainfall and transpiration rates were found to have a greater effect on water concentration in the soil than diffusion. The predictions made by the model are validated by Jordan et al. by comparison to experimentally determined data. (See also W74-07799) (See W74-05198) (Houser-ORNL) W74-07812

MODELS OF MATTER FLOW IN A SOUTHERN MIXED HARDWOOD FOREST IN FLORIDA: PRELIMINARY RESULTS,

PRELIMINARY RESULTS,
Florida Univ., Gainesville. Dept. of Botany.
A. E. Lugo, S. C. Snedaker, and J. F. Gamble.
In: Conf-710501-Proceedings of the Third National
Symposium on Radioecology, May 10-12, 1971,
Oak Ridge, Tennessee. p 929-935, (1971) 7 fig, 2
tab. 18 ref.

Descriptors: *Model studies, *Coniferous forests, Flow system, *Flow measurements, Groundwater movement, *Florida, Mineralogy, Cycles, Cycling nutrients, Cesium, Water pollution, Path of pollutant, Human population, Food chain, Public health, Seasonal, Ecosystems.

The southern mixed hardwood forest is the most diverse forest ecosystem in north central Florida, with a reported 36 tree species per thousand individuals. Although the floristic composition and climax-successional status are adequately known, little information is available on the flows and storages of energy and matter. This work is part of a larger study to trace the peculiar movement of Cs-137 into the food chains leading to man in Florida. This objective is being approached by computer modeling and simulation of the energy and matter dynamics. A qualitative model for the mineral cycles of the southern mixed hardwood forest is presented for ten elements within the major storage compartments (leaves, wood, roots, litter, and mineral soil), precipitation throughfall, and 18-month records of litter fall and accumulation. Seasonal pulsing is quantitatively described with respect to its relationship to ecosystem function. Preliminary results indicate a steady-state

system with closed mineral cycling. The implications of steady systems, relative to Cs-137 movement, in Florida are discussed. (See also W74-07799) (Houser-ORNL) W74-07813

TRANSPORT OF RADIONUCLIDES IN SEDI-MENTS.

Department of Energy, Mines and Resources, Burlington (Ontario). Canada Center for Inland Waters.

A. Lerman. In: Conf-710501-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 936-944, (1971) 4 fig, 13 ref.

Descriptors: *Radioisotopes, Distribution, Sediments, Surface waters, *Sediment distribution, Sediment transport, Sedimentation rates, *Diffusion, Absorption, Stratification, Ion exchange, *Tritium, *Great Lakes.

Patterns of distinct peak events in input of radionuclides into sediment may be easily obliterated by diffusion taking place in the interstitial waters of sediments. Rates of sedimentation derived from the positions of diffusion-broadened peaks in sediment may give values exaggerated by factors of 2-3. Diffusion-sedimentation scale distances (D/U) in lake and oceanic sediments are in general appreciably greater than diffusion decay scale distances; consequently, on the time scale of man-produced radionuclides, the rates of sedimentation do not significantly control the amount of radionuclides accumulating in the sediments by diffusion and uptake from overlying water. In a stratified sediment the chemical and physical characteristics of the thin layer near the sedimentwater interface strongly control the amount of radionuclide accumulating in the sediment. Exchange and/or adsorption on solid particles in the sediment greatly affect the amount of radionuclide stored in sediment at steady state; for tritium in the Great Lakes, the amount stored in interstitial water without uptake by solids would be only 1-6% of the amount in lake water. For metal radionuclides characterized by strong uptake by solids, the amount stored in sediment may be 10-100 times greater than the amount in lake water at steady state. (See also W74-07799) (Houser-ORNL) W74-07814

THERMOLUMINESCENT DOSIMETRY OF AQUATIR ORGANISMS,

Battelle-Pacific Northwest Lab., Richland, Wash., Ecosystems Dept. For primary bibliographic entry see Field 5C. W74-07819

ECONOMIC EVALUATION OF THE EFFECT OF SELECTED CROP PRACTICES ON NONAGRICULTURAL USES OF WATER,

Illinois Univ., Urbana. Dept. of Agricultural Economics.

H. Onishi, A. S. Narayanan, T. Takayama, and E. R. Swanson.

Available from the National Technical Informa-

Available from the National Technical Information Service as PB-232 161, \$3.75 in paper copy, \$1.45 in microfiche. Illinois Water Resources Center, Urbana, Research Report No 79, March 1974. 58 p, 3 tab, 5 fig, 4 append. OWRR B-049-ILL(5). 14-31-0001-3272.

Descriptors: *Water pollution sources, Evaluation, Water quality, Sedimentation, Linear programming, Nitrates, Income, Crops, Illinois, Watersheds(Basins), Path of pollutants. Identifiers: *Economic analysis, Nitrate contamination. Crop practices, Farm income.

Cropping systems may have an unfavorable influence on the quality of nearby surface water. Linear programming methods were used to assess the impact of improvements in certain water quali-

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ty characteristics on economically optimal crop systems. Thus, the effect of crop practices on water quality is analyzed indirectly by assuming that farmers would alter their cropping practices in the most economical way in order to conform to various water-quality constraints. A 1.200-acre watershed was used to illustrate the procedure. Sediment entering the reservoir was treated as a variable constraint on maximization of farm income. Requiring successively lower amounts of sediment to enter the reservoir caused farm income to decrease at an increasing rate. The analysis was enlarged to include a constraint on nitrate in the leachate below the root zone. This phase of the analysis also included a charge for removing at least some of the sediment entering the reservoir. As the nitrate limit on the leachate was lowered. farm income decreased at an increasing rate. The requirement of removal of the sediment by itself had little or no effect on the nitrate concentration in the leachate. Extensions of the procedure for use in other situations are suggested.

FACTORS CONTROLLING THE DYNAMICS OF NON-IONIC SYNTHETIC ORGANIC CHEMICALS IN AQUATIC ENVIRONMENTS, Purdue Univ., Lafayette, Indiana, Dept. of Forestry and Conservation.

J. L. Hamelink, and R. C. Waybrant. Available from the National Technical Informa-tion Service as PB-232 267, \$4.00 in paper copy, \$1.45 in microfiche. Indiana Water Resources Research Center, West Lafayette, Technical Report No 44, December 1973, 68 p, 10 fig, 11 tab, 5 ref, 2 append. OWRR A-017-IND(3).

Descriptors: *Pesticide kinetics, *Distribution pat-terns, *Persistence, *Pesticide removal, *Organic pesticides, *DDE, Adsorption, Food chain, Lakes, Bottom sediments, Epilimnion, Quarries.
Identifiers: Non-ionic synthetic organic compounds, Flooded quarries, *Lindane, Toxaphene.

The distribution and persistence of DDE and lindane added to the epilimnion of a thermally stratified, ultra-oligotrophic flooded limestone quarry were studied. The quarry was treated with a single sub-lethal dose of each compound at a concentration of 200 pptr in the epilimnion or 50 pptr based on the entire water mass. An adjacent quarry was used as a control. Water, bottom sediments, limestone rock slabs, zooplankton, and fish were periodically analyzed. Dissolved oxygen and temperature profiles were also monitored. Results indicated that persistence of the pesticides may be primarily controlled by adsorption onto suspended particles. DDE was lost from the water approxi-mately 15 times as fast as lindane. DDE was biologically magnified to a greater extent than lin-dane, and the DDE accumulated and retained by the invertebrates was closely correlated with the DDE concentration in the water. An equilibrium with lindane between fish and water was reached about 12 times faster than that with DDE. The results include the development of a simple two-compartment partition model that may be useful in predicting the distribution and persistence of a variety of non-ionic synthetic organic compounds. W74-07831

THE DISPERSION OF CONTINUOUSLY IN-JECTED EFFLUENTS IN OPEN CHANNELS, Louisiana State Univ., Baton Rouge. Water Resources Research Inst.

D. P. Harrison, and A. H. Wehe. Available from the National Technical Informa-tion Service as PB-232 229, \$3.75 in paper copy, \$1.45 in microfiche. Completion Report, February 1973. 52 p., 3 fig. 6 ref. OWRR A-024-LA(1).

Descriptors: Effluents, Hydraulic models, Mathematical models, Open channel flow, "Model stu-dies, "Dispersion, "Injection, "Computer models, Simulation analysis, Path of pollutants. Identifiers: Froude model.

The primary objective has been to determine the feasibility of using physical models to describe the dispersion of continuously injected effluents in open channels. The approach to the problem has been along two lines: (1) examining scale-up relationships applicable to this model to determine factors limiting a realistic scale-up, and (2) con-structing a computerized description of simple open channels to test the importance of the limiting factors and to aid in planning future experi-mental work. Concentration similitude cannot normally be obtained in an undistorted Froude model. By distorting the Froude model in accordance with the requirements of the most important of the two dispersion coefficients, vertical and lateral, one can establish concentration similitude at a short distance downstream from the injection point. This procedure has been verified with a computer model for uniform flow in straight rectangular channels with vertical and lateral dispersion. This computer model should be useful in designing models to study dispersion in open channels. W74-07833

PROCESS CONTROL MODEL FOR OXYGEN REGENERATION OF POLLUTED RIVERS, PHASES IV AND V, AND SPACIALLY AND TEMPORALLY DISTRIBUTED DISCHARGE OF EFFLUENTS IN ESTUARIES, Rutgers The State Univ., New Brunswick, N.J.

Dept. of Chemical and Biochemical Engineers.

B. Davidson.

Available from the National Technical Informa-tion Service as PB-232 226, \$3.00 in paper copy, \$1.45 in microfiche. New Jersey Water Resources Research Institute, New Brunswick, Completion Report, January 1974, 11 p, 7 ref. OWRR B-045-NJ(1), B-049-NJ(1), A-036-NJ(1).

Descriptors: *Systems analysis, *Mathematical models, *Estuaries, *Dissolved oxygen, Biochemical oxygen demand, Thermal pollution, *New Jersey, Model studies, Simulation analysis, Water pollution control.

Identifiers: *Estuarial dispersion, *Delaware Estuary(N.J.), *Oxygen regeneration.

An intra-tidal-time deterministic, one-dimensional, non-isothermal, multi-state-variable, water quality model for the Upper Delaware River Estuary System between Trenton and Wilmington was developed, verified, and applied to several simulated systems analysis problems. The unique features of the proposed model are associated with its time and space scales, which are of the order of its time and space scales, which are of the order of 30 minutes and 1 mile, respectively, and its simultaneous-state equation format, which included an ad hoc tidal velocity equation and conservation balances on dissolved oxygen, BOD, and thermal energy. Numerical routines using central differences for the space derivatives in combination with a forth-order, Runge-Kutta expression for the time derivatives provided stable and accurate results for the integration of the system equations. The capability of the proposed model was demonstrated by comparing the stationary-state, tidal-averaged simulated results with corresponding field data. Parameter sensitivity analysis and simulated shock-loading studies were made in addition to obtaining stationary-state results associated with simulated treatment plant regionalization plans. W74-07837

A STOCHASTIC MODEL FOR THE JAMES, Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center. H. E. Bard, and R. G. Krutchkoff. Completion Report, August 1973. 84 p, 17 ref. OWRR A-048-VA(1).

Descriptors: *Computer models, *Statistical models, *Virginia, Sewage, Carbon, Carbon dioxide, Phosphates, Nitrates, Nitrogen, Bacteria, Algae, Model studies.
Identifiers: *Sensitivity study, *James River estuary(Va.), Organic carbon.

Modeling the James River Estuary with the Schofield model was the major goal of the project. The model was set up for a 60 mile stretch of the estuary beginning at Richmond. Sensitivity studies involving rate constants, fresh water flow rate, sewage input, and water temperature were made and the results of these studies were analyzed. The average oxygen deficit concentration is insensitive to random water temperature, moderately sensi-tive to the sewage input rates investigated, and highly sensitive to changes in the organic carbon utilization rate constant. Organic carbon and carbon dioxide are insensitive to temperature and only moderately sensitive to change in the organic carbon rate constant. Ortho-phosphate concentration is insensitive to changes of the phosphate utilization rate constant and ortho-phosphate, organic carbon, and organic nitrogen are insensitive to a difference in the fresh water flow as great as 40%. Finally, nitrate + nitrite concentration, bacteria growth, and algae growth are insensitive to a reduction of the nitrogen waste from the point sources. W74-07843

INFLUENCE OF WATER QUALITY ON THE CORROSION AND ELECTROCHEMICAL BEHAVIOR OF MILD STEEL IN SYNTHETIC ACID MINE WATERS. Department of Energy, Mines and Resources, Ot-

tawa (Ontario) For primary bibliographic entry see Field 8G.

W74-07876

COLIFORMS ARE AN INADEQUATE INDEX OF WATER QUALITY. Canada Centre for Inland Waters, Burlington (Ontario).

For primary bibliographic entry see Field 5A. W74-07885

THE SULFATE-REDUCING BACTERIA AND OILFIELD BACTERIAL CORROSION - A REVIEW OF THE CURRENT STATE-OF-THE-

Superior Oil Co., Houston, Tex. or primary bibliographic entry see Field 8G. W74-07902

HYDROLOGY OF LIMESTONE KARST IN GREENBRIER COUNTY, WEST VIRGINIA, Geological Survey, Morgantown, W. Va For primary bibliographic entry see Field 2F.

COLLECTION, DETECTION, IDENTIFICA-TION, AND QUANTITATION OF HUMAN EF-FLUENTS, Edgewood Arsenal, Aberdeen Proving Ground,

For primary bibliographic entry see Field 5A. W74-07912

RECONNAISSANCE OF THE WATER RESOURCES IN THE VICINITY OF PROPOSED DEEP-WELL INJECTION SITES IN SOUTHEAST DADE COUNTY, FLORIDA, Geological Survey, Tallahassee, Fla. J. E. Earle, and F. W. Meyer.

Open-file report 73031, 1973. 20 p, 5 fig, 1 tab, 2

Descriptors: *Waste disposal wells, *Injection wells, *Florida, Waste water disposal, Sewage disposal, Saline water intrusion. Identifiers: *Dade County(Fla).

Deep-well injection was selected by the Dade County, Florida Water and Sewer Authority as a means of disposing treated waste water in southeast Dade County. Preliminary plans call for the construction of a county-owned sanitary

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sewage treatment plant and several 3,000-foot deep injection wells. A reconnaissance was made in the vicinity of the proposed well sites to deter-mine the chloride content of surface water and groundwater to formulate plans for the safe disposal of saltwater produced during drilling and testing of the injection wells. Most of the area is underlain by the Biscayne aquifer that contains salty water. Chloride in surface-water samples ranged from 15 to 14,600 mg/liter, and in ground-water samples from 26 to 11,500 mg/liter. Deep injection wells at the locations proposed are not expected to affect the fresh groundwater supply. The sites are all coastward from the inland extent of the salt front. (Knapp-USGS) W74-07915

HYDROLOGY AND CHLORIDE CONTAMINA-TION OF THE PRINCIPAL ARTESIAN AQUIFER IN GLYNN COUNTY, GEORGIA, Geological Survey, Atlanta, Ga. For primary bibliographic entry see Field 2F.

A NUMERICAL STUDY OF THE STEADY CIR-CULATION IN AN OPEN BAY, Florida State Univ., Tallahassee. Dept. of Oceanography., and Florida State Univ., Tallahas-see. Geophysical Fluid Dynamics Inst.

For primary bibliographic entry see Field 2L. W74-07924

BIG EDDIES AND MIXING PROCESSES IN THE GREAT LAKES,

Waterloo Univ. (Ontario).

G. T. Csanady. Available from Sup Doc, GPO, Washington, D.C. Avanatie from Sup Boc, GPO, Washington, B.C. 20402, price \$0.50; from NTIS Springfield, Va. 22151, as PB-228 094, \$1.45 microfiche. Environ-mental Protection Agency Ecological Research Series EPA-660/3-73-011, September 1973. 13 p.

Descriptors: *Eddies, *Mixing, *Path of pollutants, *Great Lakes, Lake Huron, Water circula-tion, Currents(Water), Diffusion, Diffusivity, Dispersion, Dye releases, Turbulence, Mathematical models

Identifiers: Langmuir circulation, Coastal jets.

Physical factors involved in the disposal of effluents in the Great Lakes were studied on Lake Huron in the summer seasons of 1967 and 1968. Some direct measurements of lake turbulence intensity were obtained. The structure of large eddies was studied. Some information was obtained on the interrelationship of short internal waves and turbulence. The turbulence intensity level is proportional to effective diffusivity. Coastal flow processes are of importance in pollution problems because of the observed coastal entrapment of pollutants discharged near shore. Theoretical models of the coastal boundary layer led to the discovery of coastal jets. (Knapp-USGS) W74-07926

PROCESSES, PROCEDURES, AND METHODS TO CONTROL POLLUTION FROM MINING

Skelly and Loy, Harrisburg, Pa. For primary bibliographic entry see Field 5G.

BACTERIOLOGICAL WATER QUALITY DATA, BEACH AREAS, GATINEAU PARK LAKES, NATIONAL CAPITAL COMMISSION, 1973.

Environmental Protection Service, Ottawa (Ontario).

A. D. Tennant, J. A. P. Bastien, R. Toxopeus, J. P. Hayes, and M. Beauchamp. Surveillance Report EPS-5-WP-74-1 (Water Pollu-

tion Control Directorate), February 1974. 45 p, 7 fig, 10 tab, 5 ref.

Descriptors: *Monitoring, *Water quality, *Beaches, *Canada, Water pollution, Bacteria, Coliforms, Bioindicators, Swimming, Recreation. Identifiers: *Ottawa River(Canada)

Seven Canadian National Capital Commission beaches in Gatineau Park, and Camp Pontiac Beach on the Ottawa River, were monitored bacteriologically during the summer of 1973. A total of 878 water samples from 46 nearshore beach sampling points were subjected to standard membrane filtration density-estimate tests for coliforms, fecal coliforms and fecal streptococci. No signifi-cant pollution sources were found, and median bacterial count data for all beach areas easily met all water quality objectives for recreational waters. There has been no degradation of the excellent bacterial water quality which has prevailed in these popular recreational areas since studies began in 1970. (Knapp-USGS) W74-07932

GROUND-WATER QUALITY MODELS: WHAT THEY CAN AND CANNOT DO,

Water Resources Engineers, Inc., Walnut Creek,

D. E. Evenson, G. T. Orlob, and T. C. Lyons. Ground Water, Vol 12, No 2, p 97-101, March-April 1974. 10 ref.

Descriptors: *Water quality, *Groundwater, *Mathematical models, Reviews, Simulation analysis, Data collections, Model studies. Identifiers: *Water quality models.

The development and application of mathematical models to simulate water quality behavior in groundwater basins is reviewed. In the last few years, models have been developed to simulate conservative and some nonconservative con stituents under both saturated and unsaturated soil conditions. In addition, models have been found to provide additional information for calibration of quantity models, to identify major data gaps and deficiencies, to be useful in the design of data collection programs and in the interpretation of col-lected data, to be valuable to watershed planners and managers through evaluation of alternative regulatory policies, physical facilities and management operational plans, and to point out where future research efforts are needed. (Knapp-USGS) W74-0793

GEOHYDROLOGY OF THE BURIED TRIASSIC BASIN AT THE SAVANNAH RIVER PLANT, DuPont de Nemours(E.I) and Co., Aiken, S.C. Savannah River Lab. I W Marine

Ground Water, Vol 12, No 2, p 84-95, March-April 1974. 9 fig, 4 tab, 32 ref. AEC contract AT(072)-1.

*Hydrogeology, *Groundwater Descriptors: Descriptors: "Hydrogeology, "croundwater basins, "Georgia, "Radioactive wastes, "Underground waste disposal, Water levels, Hydrologic data, Underground storage, Safety, Groundwater movement, "South Carolina. Identifiers: "Savannah River Plant(So.Car.-Geo).

At the Savannah River Plant near Aiken, South Carolina, high-level radioactive wastes are stored in concrete and steel tanks buried just beneath the surface of the ground. One concept for the terminal containment of this waste is to store it in ex-cavated chambers within the bedrock, which is covered by about 1000 feet of Coastal Plain sediments. A buried Triassic basin that might have potential for waste storage was discovered beneath the southern third of the plant site. Seismic surveys, gravity and magnetic surveys, and the drilling of several exploratory wells indicate that the Triassic basin is about 30 miles long, 6 or more miles wide, and perhaps 5300 feet thick. The rock is predominantly mudstone of very low permeability with a few lenses of poorly sorted gritty sand. The water yield of all the ex-ploratory wells is extremely low, and water-transmitting fractures are virtually nonexistent. In two wells within the basin, heads above land surface have been measured that cannot be explained by connection with a recharge area. Possible explanations are: tectonic compression, temperature increase, and osmotic membrane phenomena. (Knapp-USGS)
W74-07934

METHODS AND PRACTICES FOR CON-TROLLING WATER POLLUTION FROM AGRICULTURAL NONPOINT SOURCES.

Available from Sup Doc, GPO, Washington, D.C. 20402, price \$1.10. Environmental Protection Agency Office of Water Program Operations ublications EPA-430/9-73-015, October 1973. 83 p. 18 fig. 34 ref.

Descriptors: *Water pollution control, *Farm wastes, *Sedimentation, *Nutrients, Erosion control, Pesticides, Fertilizers, Wind erosion, Soil conservation, Farm management.

Potential nonpoint agricultural sources of surface and groundwater pollution include sediment, pesticides, fertilizer, and plant and animal wastes and residue from cropland, grazing areas, and farm woodlots. Sound management practices are the key to achieving acceptable water quality. Proper land use and agricultural management practices will keep soil, plant nutrients, and organic matter on the land, rather than allow them to become part of the waterborne pollutant load. Erosion may be reduced by means of conservation tillage, terraces, diversions, stripcropping, contouring, grassed waterways, and crop rotations, and by more efficient range, pasture, and woodlot management. Reducing nutrient losses from agricultural operations can be accomplished by three general approaches: (1) determining the proper amount, time, and method of plant nutrient applications to ensure efficient use by plants. (2) adopting approved cultural practices, including tillage and crop rotations, and (3) reducing soil and water runoff. There are several approaches to reduce the quantity of pesticides entering surface water and groundwater. These include: controlling erosion and minimizing wine drift; reducing the quantity of pesticides used, and using biodegradable rather than persistent pesticides. Appropriate animal and land management practices should be followed. These include: (1) spreading acceptable rates of manure uniformly on land; (2) applying feedlot runoff effluent on land as recommended for specific site conditions; (3) maintaining an adequate land-to-livestock ratio on pastures; and (4) locating feeders and waterers a reasonable distance from streams and watercourses. (Knapp-W74-07941

PROCESSES, PROCEDURES, AND METHODS TO CONTROL POLLUTION RESULTING FROM ALL CONSTRUCTION ACTIVITY.

HIGH ALL CONSTRUCTION ACTIVITY. Hittman Associates, Inc., Columbia, Md. Available from Sup Doc, GPO, Washington, D.C. 20402, price \$2.30. Environmental Protection Agency, Office of Air and Water Programs Report EPA 430/9-73-007, October 1973. 234 p, 62 fig, 1

Descriptors: *Water pollution control, *Sediment control, *Construction, Soil stabilization, Storm runoff, Urbanization, Erosion control. Identifiers: Water pollution control act.

Methods for controlling sediment, stormwater, and pollutants other than sediment which result from construction activities are described. Processes examined include site planning, preliminary site evaluation and design, use of planning tools, and structural and vegetative design. Methods examined include on-site erosion, sediment, and stormwater management control structures as well as soil stabilization practices useful for achieving control of sediment, stormwater ru-

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noff, and other pollutants resulting from construction activities. Stormwater management practices are discussed in detail. Water pollution resulting from sediment and other pollutants generated from construction activities can be prevented by the timely application of structural and soil sta-bilization measures presently available. (Knapp-USGS) W74-07942

ICELANDIC GEOTHERMAL ACTIVITY AND THE MERCURY OF THE GREENLAND ICECAP,

Hawaii Univ., Honolulu. Dept. of Microbiology. B. Z. Siegel, S. M. Siegel, and F. Thorarinsson. Nature, Vol 24, No 5391, p 526, February 23, 1973. 1 fig. 10 ref.

Descriptors: *Mercury, *Geothermal studies, *Icebergs, Heavy metals, Air pollution, Water pollution, Sampling, Distribution patterns, Analytical techniques, Environmental effects, Sea water,

Identifiers: *Geothermal energy, *Greenland

Following the demonstration of high levels of atmospheric mercury in Hawaiian thermal areas (see W73-05396), similar aerometric studies were conducted at a number of sites in Iceland during June and July 1972. Field air sampling procedures and analyses by flameless atomic absorption were carried out. Although atmospheric mercury levels vary greatly according to site, samples from several widely separated locations yielded Hg concentrations well above the range commonly cited for unpolluted air, 0.001-0.010 micrograms/cu m. The general reliability of field measurements is indicated by samples taken at the Krysuvik thermal area where duplicate analyses on each of four separate sample traps yielded a mean value of 11.3 micrograms/cu m and a standard error of only plus or minus 1.8 micrograms/cu m. (Oleszkiewicz-Vanderbilt) W74-07944

FOAM FRACTIONATION OF MERCURY(II)

NITRO COMPLEXES, National Lead Co., Hightstown, N.J. For primary bibliographic entry see Field 5A. W74-07945

IRON AND ASSOCIATED TRACE MINERAL PROBLEMS IN MAN AND ANIMALS, Food and Drug Administration, Washington, D.C.

Div. of Nutrition. For primary bibliographic entry see Field 2K. W74-07950

ORGANO-MERCURY FUNGICIDE TREAT-MENT OF SUGAR-BEET SEED, Broom's Barn Experimental Station, Bury St. Ed-

munds (England). W. J. Byford.

Annals of Applied Biology, Vol 69, No 3, p 245-252, 1971. 3 fig, 4 tab.

Descriptors: *Fungicides, *Seed treatment, *Mercury, Seeds, Pesticides, Trace elements, Heavy metals, Foods, Agricultural chemicals, Pesticide residues, Laboratory tests, Toxicity. Identifiers: *Organomercuric compounds, Organomercurials, Pesticide application.

Sugar-beet seed treated with 1% (V/W) of 1.2% ethylmercuric phosphate (EMP) solution applied as a mist gave seedling emergence in the field and final plant stand comparable to those of seed treated by 40 ppm EMP steep. However, when the mist-treated seed was stored after treatment, phytotoxic effects sometimes developed; consequently the treatment is not considered a suitable replacement for the EMP steep, now given to all sugar-beet seed in Britain. (Oleszkiewicz-Vap-W74-07951

TISSUE SULFHYDRYL GROUPS IN SELENI-UM-DEFICIENT RATS AND LAMBS,

Oregon State Univ., Corvallis. Dept. of Agricultural Chemistry.
M. A. Broderius, P. D. Whanger, and P. H.

Weswig. Journal of Nutrition, Vol 103, p 336-341, 1973. 1 fig, 4 tab, 17 ref.

Descriptors: "Metals, "Nutrients, "Diets, "Animals, Trace elements, Foods, Animal pathology, Metabolism, Laboratory tests. Identifiers: "Selenium, Selenium deficiency, Tissue, Sulfhydryl groups, Animal tests.

The effects of selenium deficiency on tissue sulf-hydryl compounds in rats and lambs were investigated. No significant differences were found in any sulfhydryl fraction in liver, heart or kidney of normal and selenium-deficient (WMD) lambs. A significant decrease of total and protein sulfhydryl groups was found in muscle of WMD lambs com-pared to normals while a significant increase in nonprotein sulfhydryl and reduced glutathione was found in WMD lamb muscle. No increase in disulfide bonds was found in the muscle of deficient lambs to account for the decrease in sulfhydryls, suggesting they were not being oxidized to disulfides. Livers from selenium-deficient rats had a significantly higher content of total and non-protein sulfhydryl compared to selenium-supple-mented rats. The opposite trend was observed for the protein sulfhydryl groups. The results suggest the involvement of selenium in the metabolism of sulfhydryl compounds. (Oleszkiewicz-Vanderbilt) W74-07952

POLLUTION CONTROL, New Mexico State Univ., Las Cruces. Water Resources Research Inst. For primary bibliographic entry see Field 6D. W74-07970

ENERGY-WATER PROBLEMS RECIONAL. SOUTH ATLANTIC GULF,

Georgia Inst. of Tech., Atlanta. Environmental Resources Center. For primary bibliographic entry see Field 6D. W74-07972

REGIONAL ENERGY-WATER PROBLEMS. OHIO-GREAT LAKES.

Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources For primary bibliographic entry see Field 6D. W74-07973

ENERGY-WATER PROBLEMS. REGIONAL

MISSOURI RIVER,
North Dakota State Univ., Fargo. Water
Resources Research Inst. For primary bibliographic entry see Field 6D. W74-07974

WATER QUALITY PROBLEM IN LOBSTER HOLDING TANKS,

Rhode Island Univ., Kingston. Marine Advisory For primary bibliographic entry see Field 8I.

HARBOR POLLUTION FROM LARGE SHIPS. Naval Undersea Center, San Diego, Calif. Dept. of Fleet Engineering.

G. L. Donohue, and J. W. Hoyt. Available from the National Technical Informa-tion Service as AD-769 476 \$2.75 in paper copy, \$1.45 in microfiche. NUC TP 368, October 1973. 13 fig, 2 tab, 9 ref. SF 53554002, Task 17225.

Descriptors: *Harbors, *Dispersion, *Ships, *Sewage disposal, Water pollution, Diffusion,

Bays, Estuaries, Rhodamine, Tur Coliforms, Eddies, Mathematical studies. Turbulence, Identifiers: Navy ships, San Clemente Island (Calif.)

Data were developed to ascertain the magnitude of sewage pollution arising from Navy ships anchored in or moving through a small harbor, with particular reference to amphibious training exercises in which large numbers of personnel may be brought to nearshore areas. A number of releases of dyed sewage were made in Wilson Cove Harbor, California at rates corresponding to those at which sewage would be discharged by amphibious task forces of from 500 to 10,000 men. The movement of the sewage was traced by photography, bacterial counts, dye, and BOD measurements in the surrounding water and on the shoreline. The sewage was taken from the San Clemente Island sewage outfall, sampled for BOD, then 19,000 liters were dyed with Rhodamine WT and stirred for homogeneity. The sewage was released from both sides of a barge, and flow rates were estimated by catch-and-weigh techniques. Sewage was found to diffuse more slowly in a small harbor than would be expected from openocean data. Navy ships carrying significant num-bers of men can operate in small harbors for certain times and distances from the shore without danger of pollution if the operational chart included is used as guidance. (Jones-Wisconsin) W74-08006

PRESENT PROBLEMS IN THE STUDY OF SUR-FACE-WATER QUALITY (AKTUAL'NYYE PROBLEMY ISSLEDOVANIYA KACHESTVA POVERKHNOSTNYKH VOD), Gosudarstvennyi Gidrologicheskii Institut, Lenin-

grad (USSR). For primary bibliographic entry see Field 5G. W74-08050

GROUNDWATER POLLUTION AND CONSER-

Environmental Science and Technology, Vol 6, No 3, p 213-215, March, 1972. 2 fig.

Descriptors: *Groundwater, *Aquifers, *Aquifer systems, Areal hydrology, Bodies of water, Dug wells, Groundwater availability, Groundwater resources, Soil water, *Water pollution sources.

A general overview of the groundwater reserves in the United States is presented. Possible sources of contamination are outlined. Suggested programs for regulation of groundwater use are discussed. A map showing the known aquifers in the United States that are capable of yielding wells of 50 gpm or more at salinity levels not higher than 2000 ppm was developed. (Skogerboe-Colorado State) W74-08071

INJECTION WELLS POSE A POTENTIAL THREAT.

Environmental Science and Technology, Vol 6, No 2, p 120-122, February, 1972. 3 fig.

Descriptors: *Groundwater, *Waste disposal wells, *Injection wells, *Underground waste disposal, Waste disposal, Waste storage, Waste ater disposal, Risks.

Injection wells for waste disposal are discussed. There are literally tens of thousands of wells now being used. There are no records of areas where wastes have already been injected. There is a need for further research to develop the needed technology. Since the effects of pollutants in the groundwater system are both slow to appear and correct, great care should be taken to minimize the risks. (Skogerboe-Colorado State)

Effects Of Pollution-Group 5C

SOWING OF PONDS AND CARP WITH CLOS-TRIDIUM PERFRINGENS, (IN UKRAINIAN), Belotserkovskii Selskokhozyaistvennyi Institut,

Belya Tserkov (USSR).

P. V. Myktytyuk. Mikrobiol Zh (Kyyiv). Vol 34, No 6, p 790-791,

1972. (English summary).
Identifiers: *Carp, *Clostridium-perfringens, Ponds, *Sowing, *Bacteriological studies.

Results of the bacteriological investigation of environmental objects and carp in a pond farm are discussed. Sowing of the environmental objects of ponds with Cl. perfringens is 66.8, and carp-51.8%, of the total of the samples. Clostridia of the types A, B, C, D are isolated from the samples. The types A and D were the most distributed --Copyright 1973, Biological Abstracts, Inc. W74-08076

QUALITY OF DRINKING WATER ON SHIPS IN RELATION TO SAILING CONDITIONS, (IN RUSSIAN),

Black Sea-Azov Watershed Basin Sanitary Epidemiology Station, Odessa (USSR).

A. M. Voitenko.

Gig Sanit. Vol 37, No 10, p 94-95. 1972.

Identifiers: Bacteriological studies, *Black Sea, Coatings, *Gastrointestinal diseases, Ships, Water quality, *Potable water, Human diseases, quality, *Pota *Storage tanks.

Laboratory investigations of the physicochemical and bacteriological composition of drinking water during cruises on 6 ships in the Black Sea showed that the water quality depends on many respects on the composition of the inside coating of the tanks for storing fresh water. The most common coatings on the ships were cement, cement-latex. paints and lacquers. Measures were taken to improve the water quality and the incidence of gastrointestinal diseases among sailors dropped by about 50% .-- Copyright 1973, Biological Abstracts, W74-08082

INFILTRATION AND LANDFILL BEHAVIOR,

Waterloo Univ. (Ontario). F. A. Rovers, and G. J. Farquhar.

Journal of the Environmental Engineering Divi-sion, American Society of Civil Engineers, Vol 99, No EE5, p 671-690, October, 1973, 7 fig. 8 tab. 33

*Environmental Descriptors: engineering, Landfills, Sanitary engineering, *Infiltration. Leaching, Absorption, Evaporation, Gases, Methane, Temperature, Thawing.

The effects of infiltration on sanitary landfill leachate and gas production were examined under both field and laboratory conditions. Maximum field leachate production occurred during spring thaw. Production was greatly reduced during the summer. Moisture absorption prior to leachate flow ranged from 10.0 cm/m to 14.2 cm/m of compacted refuse. The leachate produced was strong. As an indication, concentrations of COD, calcium, chloride and ammonia nitrogen exceeded 40,000 mg/1, 2,500 mg/1, 1,200 mg/1, and 600 mg/1, respectively. Decomposition proceeded anaerobically with the production of methane and carbon dioxide. Periods of rapid moisture influx were accompanied by increased leachate strength, reduced pH, and decreased methane production thus allowing the accumulation of organic acids and subsequent reductions in pH. The interference appeared to have arisen from an increase in oxida-tion-reduction potential. (Skogerboe-Colorado State) W74-08083

RECOVERY, RESIDUAL EFFECTS, AND FATE OF NITROGEN FERTILIZER SOURCES IN A

SEMIARID REGION,
Agricultural Research Service, Mandan, N. Dak.
Northern Great Plains Research Center. J. F. Power, J. Alessi, G. A. Reichman, and D. L. Grunes.

Agronomy Journal, Vol 65, No 5, p 765-768, September-October, 1973. 2 fig, 3 tab, 13 ref.

Descriptors: *Nutrient removal, *Leaching, *Nitrogen, *Fertilizers, Nitrates, Crop response, Water pollution sources, *Path of pollutants. Identifiers: *Fate of pollutants.

In a field experiment four fertilizer N sources were applied to separate areas of corn and bromegrass for four years. From the fifth through seventh years, the two areas were uniformly seeded to barley without additional N fertilization. until residual effects were no longer significant. Sources of N used were ammonium sulfate, ammonium nitrate, calcium nitrate, and urea, applied at either 55 or 110 kg/ha to Parshall fine sandy loam. Recovery of fertilizer N in corn plant tops was greatest for ammonium nitrate. Over 35% of the calcium nitrate and urea applied at 110 kg/ha of N to corn was leached below the root zone. Leaching of fertilizer N applied to bromegrass was insignificant. Except for urea, fertilizer N recovery by bromegrass from the other N sources was nearly equal and usually higher at 55 kg/ha. Residual growth responses were smaller from N applied to bromegrass that to corn. (Skogerboeolorado State) W74-08086

QUALITY OF DRAINAGE WATER FROM A HEAVY-TEXTURED SOIL,

Ohio State Univ., Columbus. Dept. of Agricultural Engineering.

G. O. Schwab, E. O. McLean, A. C. Waldron, R. K. White, and D. W. Michener.

Transactions of the ASAE (American Society of Agricultural Engineers), Vol 16, No 6, p 1104-1107, November-December, 1973. 2 fig, 3 tab, 11

Descriptors: *Water pollution sources, *Runoff, *Leaching, Nutrient removal, Agricultural chemi-cals, Erosion, Nitrogen, Phosphorus, *Drainage. Identifiers: *Toledo clay soils

Sediment, dissolved solids, nine chemical elements or ions, five pesticides, electrical conduc-tivity, pH, and BOD in tile drainage effluent and in surface runoff were measured from one-half acre plots on Toledo silty clay soil near Sandusky, Ohio, for a 3-year period, 1969-1971. Measurements were taken from both conventional tilled and no-tilled plots in continuous corn. Irrigation water was applied each year to simulate heavy rainfall. Recommended fertilizer amounts were applied, but pesticide kinds and amounts were greater than normally required for insect or weed control. Rainfall was above average in 1969 and 1970, and below average in 1971. Sediment losses from the tile and surface drainage water were several times greater for conventional tillage than for no tillage. (Skogerboe-Colorado State)

FLOOD AND SEEPAGE WATER SAMPLING TECHNIQUES IN RICE FIELDS UNDER DIF-FERENT WATER MANAGEMENT PRAC-TICES.

California Univ., Davis. Dept. of Water Science

and Engineering. K. K. Tanji, J. W. Biggar, M. Mehran, and D. W. Henderson.

Soil Science Society of America Proceedings, Vol 37, No 3, p 483-485, May-June, 1973. 3 fig, 1 tab.

Descriptors: *Water pollution sources, *Nutrient removal, Leaching, *Flooding, *Seepage. Water sampling,

Sampling equipment enables collection of flood and seepage waters to determine persistence and transport of chemicals applied in flooded rice culture. This system gives a capability of the evaluating the effects of different chemical application methods (water-applied, soil-incorporated) and water management systems (static, flow-through, and recycled). (Skogerboe-Colorado State) W74-08090

STUDIES ON THE OCCURRENCE OF PLANK-TONIC ROTATORIA IN URBAN WATERS AND THEIR RELATIONSHIP TO SAPROBISM. (IN GERMAN), Hamburg Univ. (West Germany). Museum of

Zoology.

For primary bibliographic entry see Field 2I. W74-08111

EFFECT OF WATER-SOLUBLE DECOMPOSI-TION PRODUCTS OF HERBACEOUS PLANTS ON UPTAKE OF RADIOISOTOPES IN SOIL. (IN RUSSIAN).

Akademiya Nauk SSSR, Sverdlovsk. Inst. of Plant

and Animal Ecology.
For primary bibliographic entry see Field 2G. W74-08117

5C. Effects Of Pollution

SEASONAL CHANGES IN WATER QUALITY AND PRIMARY PRODUCTIVITY IN DOE VAL-LEY LAKE, Kentucky Univ., Lexington. Water Resources

Research Inst.

E. J. Bacon, and S. E. Neff.

Available from the National Technical Information Service as PB-232 003, \$4.50 in paper copy, \$1.45 in microfiche. Research Report No 72, March 1974. 107 p, 32 fig, 17 tab, 85 ref. OWRR A-039-KY(1). 14-31-0001-3517 and 14-31-0001-3817.

Descriptors: Ecology, *Water quality, Environmental effects, Planning, *Kentucky, *Primary productivity, Pre-impoundment, Aquatic habitats, *Seasonaol, Chlorophyll, Standing crops, *Lake stages, Hypolimnion, Lake mo Anaerobic conditions, Phytoplankton. morphometry, Identifiers: Oxygen depletion, Monomictic lakes,

Dimictic lakes.

Primary productivity and water quality were stu-died in Doe Valley Lake, a 147-hectare impoundment on Doc Run, a spring-fed stream in Meade County, Kentucky, from 13 June 1969 to 31 July 1972. Doe Valley Lake is menomictic during most winter seasons, but it is dimictic during more severe winters because of its morphometry and location on the borderline climatic region for dimictic lakes (37 degree N latiitude). Oxygen depletion in the hypolimnion is severe, and anaerobic conditions usually prevail by late June. A hypolimnetic areal deficit of 0.038 mg/sq cm/day was calculated. Super-saturation of oxygen in the epilimnion was common, and metalimnetic maxima exceeded 150 percent saturation in spring and early summer. Pri-mary productivity ranged from 44 to 1,192 mgC/sq m/day and annual rates at Stations I and III were 277 and 255 gC/sq m/yr, respectively. Productivity fluctuated considerably at Station I as a result of turbidity, but average daily rates and chlorophyll levels were higher than at Station III. Periodic flooding drastically lowered productivity and phytoplankton standing crops. Negative or low correlations were found between productivity and turbidity, pH, alkalinity, nitrates, and phosphates. The relationship between productivity and standing crop of phytoplankton varied throughout the year but positive correlations were observed on an annual basis. Chlorophyll alpha levels correlated fairly well with net phytoplankton. Except during summer, nannoplankton contributed more than 50 percent of the total carbon assimilation. (Grieves-W74-07605

Group 5C-Effects Of Pollution

EFFECTS OF CRUDE OIL AND SOME OF ITS COMPONENTS ON YOUNG COHO AND SOCKEYE SALMON

Alaska Univ., College. Dept. of Biological Sciences

I.E. Morrow

Copy Available from GPO Sup Doc as EP1.23:660/3-73-018, \$0.85; microfiche from NTIS as PB-232 094 \$1.45. Environmental Protection Agency, Ecological Research Series Report EPA 660/3-73-018, January 1974. 37 p, 20 tab, 10 ref. EPA Project R 801039 (formerly 16100FWQ).

Descriptors: *Oil pollution, *Alaska, *Sockeye salmon, *Organic compounds, Oil wastes, *Toxicity, Aromatic compounds, Lethal limit, *Mortality, Fish, Water pollution effects. Identifiers: *Crude oil, *Coho salmon, Aliphatic Aromatic hydrocarbons, hydrocarbons. Monovalent blood ions, Cell membranes(Fish).

Young coho and sockeye salmon, acclimated to 30 o/oo salinity, were exposed in various ways to dif-ferent amounts of crude oil from the Prudhoe Bay field. Oil poured on the surface of the water in 95 liter (25 gallon) aquaria produced significant mortalities when the oil concentration was 500 ppm or greater. Fish dipped into a crude oil film, or with a drop of oil placed directly on each gill, showed no significant mortalities. The same was true of fish force-fed crude oil at 1 g per 100 g body weight. Oil that had been exposed to air for 30 days produced no significant mortalities. Among oil components tested for toxicity on coho salmon, aliphatic com-pounds were not lethal. Mono-cyclic aromatics were generally toxic, the degree of toxicity increasing with the degree of unsaturation. It is suggested that the toxicity of these substances is brought about through alteration of cell membrane permeability, especially in the gills. This results in a rapid increase of mono-valent ions in the blood and probably also interferes with CO2-HCO3 regulation. (EPA) W74-07613

EFFECT OF DEICING CHEMICALS ON GROUND AND SURFACE WATER--(MODUS OPERANDI),

Geological Survey, Boston, Mass.
For primary bibliographic entry see Field 5B. W74-07617

CHESTER RIVER STUDY, VOLUMES I, II, AND III.

For primary bibliographic entry see Field 5B. W74-07653

BIOCHEMICAL INVESTIGATIONS, For primary bibliographic entry see Field 5B. W74-07654

BIOLOGICAL INVESTIGATIONS. For primary bibliographic entry see Field 5B. W74-07656

MERCURY IN THE ENVIRONMENT, AN EPIDEMIOLOGICAL AND TOXICOLOGICAL

Descriptors: *Mercury, *Environmental effects, *Analytical techniques, *Public health, Air pollution, *Water pollution, Transportation, Chemical analysis, Chemical reactions, Biochemistry, Oranic compounds, Inorganic compounds, Toxicity, Bioindicators, Metabolism, Bioassay, Genetics, Animal pathology, Laboratory tests, Measurement. Evaluation. *Reviews. *Bibliographies.

A comprehensive discussion is presented concerning mercury in the environment and its possible effects on human health. Chapters are included on: methods of analysis; the transport and transformation of mercury in nature; the metabolism of mercury compounds; organic mercury compounds; normal levels of mercury in humans; the genetic effects of mercury compounds and a general discussion and conclusion. A great many studies on all aspects of mercury transport and its effects are reported, but the general conclusion is that still more investigation is needed. (See W74-07681 thru W74-076989) (Jerome-Vanderbilt) W74-07680

METHODS OF ANALYSIS, Arbetsmedicinska Institutet, Stockholm (Sweden). For primary bibliographic entry see Field 5A. W74-07681

TRANSPORT AND TRANSFORMATION OF MERCURY IN NATURE AND POSSIBLE ROUTES OF EXPOSURE, Rochester Univ., N.Y. Dept. of Pharmacology and

Toxicology.
For primary bibliographic entry see Field 5B.

W74-07682

METABOLISM.

Karolinska Institutet, Stockholm (Sweden). Dept. of Environmental Hygiene.
For primary bibliographic entry see Field 5B. W74-07683

SYMPTOMS AND SIGNS OF INTOXICATION. National Swedish Food Administration, Stockholm. Dept. of Nutrition and Food Hygiene. S. Skerfving, and J. Vostal. In: Mercury in the Environment, (Chemical Rubber Co. Press), p 93-107, 1972, 2 tab.

Descriptors: *Mercury, *Toxicity, *Human pathology, *Organic compounds, *Inorganic compounds, Water pollution, Air pollution, Poisons, Metabolism, Respiration, Inhibitors, Investiga-

The effects of acute and chronic poisoning from organic and inorganic mercury compounds and individual variability in tolerance of trace amounts of these compounds are discussed. Acute intoxication by inorganic mercury can result in bronchial irritation or diffuse interstitial pneumonitis from vapor inhalation, and local necrotic changes in the gastrointestinal tract, circulatory collapse or acute renal failure from salts ingestion. Early chronic renal failure from salts ingestion. Early chronic poisoning by inorganic mercury is characterized by anorexia, loss of weight and minor symptomatology of the central nervous system. Later phases are characterized by tremor, psychic disturbances and personality changes. Idiosyncratic reactions are many and various. Prenatal intoxication from short chain alkylmercury company result in gauster many factor. pounds may result in severe mental and motor symptoms. Postnatal poisoning with such organic mercury compounds may give rise to such sensory disturbances as ataxia, concentric constriction of visual fields and hearing loss. In some cases gastrointestinal and pulmonary symptoms have been reported. Phenyl and methyl mercury poisonings result in kidney damage and neurological symp-toms. (See also W74-07680) (Jerome-Vanderbilt) W74-07684

'NORMAL' CONCENTRATIONS OF MERCURY IN HUMAN TISSUE AND URINE,
National Swedish Food Administration.

Stockholm. Dept. of Nutrition and Food Hygiene. S. Skerfving.
In: Mercury in the Environment, (Chemical

Rubber Co. Press), p 109-112, 1972, 5 tab.

Descriptors: *Mercury, *Human physiology, *Laboratory tests, *Distribution, Water pollution effects, Air pollution, Metals, Toxicity, Human pathology, Biochemistry, Urine, Measurement, Evaluation.

Identifiers: Blood, Human tissue.

In order to assess the extent of mercury intoxica-tion, a 'normal' level of mercury in the human body must be established. Data concerning persons reported not to have been subjected to any sons reported not to have been subjected to any special kind of mercury exposure are presented. Levels of mercury in blood cells, hair, and urine, are of the greatest interest, but concentrations in other tissues and organs are considered also. Analyses of 814 whole blood samples from 15 different countries were performed in one laboratory using an atomic absorption method. Seventy-seven percent of all the samples had concentra-tions below 5 ng/ml, 85% below 10 ng/ml, and 95% below 30 ng/ml. It was proposed that about 30 ng/ml should be regarded as the upper limit for 'normal' conditions. In several studies of total mercury concentration in hair the mean concentrato 7.0 micrograms/g. In analyses of 1.107 urine samples, 79% had levels below 0.5 micrograms/l. 86% below 5.0 micrograms/1, and 95% below 20 micrograms/1. Brain, liver and kidney tissue were also investigated. (See also W74-07680) (Jerome-Verstebel) Vanderbilt) W74-07685

INORGANIC MERCURY-RELATION

INORGANIC MERCURY-RELATION BETWEEN EXPOSURE AND EFFECTS, Karolinska Institutet, Stockholm (Sweden). Dept. of Environmental Hygiene.
L. Friberg, and G. F. Nordberg.
In: Mercury in the Environment, (Chemical Rubber Co. Press), p 113-139, 1972, 10 fig, 12 tab.

Descriptors: *Air pollution, *Mercury, *Inorganic compounds, *Toxicity, *Water pollution effects, Metals, Environmental effects, Human pathology, Animal pathology, Human physiology, Animal physiology, Biochemistry, Metabolism, Urine, Laboratory tests, Measurement evaluation.

Dose-response relationships found in chronic exposure to inorganic mercury and some data relating to acute exposure are considered for humans and other animals. Urine, blood and air levels were correlated with symptoms of mercury poisoning. It was found that no significant symptoms resulted from exposure to mercury below the level of 0.1 mg/cu m of air. The relations of mercury in blood and in urine are discussed in terms of exposure level. Russian studies on micromercurialism indicate there may be some correlation between ex-posure to very small amounts of mercury and an asthenic-vegetative syndrome and other disorders. In tests using laboratory animals it was found that mjected mercury can give rise to poisoning at 5 mg/cu m levels. When exposure is by inhalation of mercury vapor, acute effects occur in the lung, brain, kidney and colon. Concetnrations of 10 mg/cu m may be fatal within one or a few days. In studies of rabbits subjected to concentrations of 0.01 to 0.03 mg. Halou m. for example 0.01 to 0.03 mg Hg/cu m for several months, definite changes in functions of several organs and biochemistry were noted. Changes in conditioned reflexes have been reported even at concentra-tions in the air of 0.002 to 0.005 mg Hg/cu m. (See also W74-07680) (Jerome-Vanderbilt)

ORGANIC MERCURY COMPOUNDS-RELA-TION BETWEEN EXPOSURE AND EFFECTS, National Swedish Food Administration, Stockholm. Dept. of Nutrition and Food Hygiene.

S. Skerfving.
In: Mercury in the Environment, (Chemical Rubber Co. Press), p 141-168, 1972, 6 fig, 7 tab.

Descriptors: *Mercury, *Toxicity, *Water pollution effects, Air pollution, Food chains, Metals, *Organic compounds, Environmental effects, Human pathology, Animal pathology, Bioindicators, Bioassay, Investigations, Growth stages, Metabolism, Laboratory tests, Evaluation, Data collections. collections.

Identifiers: Prenatal, Postnatal, Nervous system.

Effects Of Pollution—Group 5C

The effects of human and animal prenatal and postnatal exposure to organic mercury compounds are discussed. Poisoning observed in children of mothers exposed to methyl and ethyl mercury compounds indicates the transplacental capabilities of these compounds. Neurological damage was much more severe in children than in mothers. Some mothers who had concentrations of 100 micrograms Hg/g of hair gave birth to healthy children. No information was available for Hg concentrations in hair or blood of mothers of poisoned children at the time of delivery. Feeding pregnant animals organic mercury compounds resulted in reduced litter size and/or weight, fetal death, resorption, neonatal death, morphological lesions and damage to the central nervous system. Ouantitative information on the neurological effects of methylmercury and mono and di- ethyl mercury is scarce. Low exposures have been reported as poisonous while large doses have sometimes not resulted in damage. Oral toxicity of phenylmercury compounds was found to be rather low. There is some evidence of mercury absorption through skin from phenyl mercury compounds. Inhalation of phenylmercury compounds has been known to cause poisoning after a rather short period of exposure. (See also W74-07680) (Jerome-Vanderbilt) W74-07687

GENETIC EFFECTS, Stockholm Univ. (Sweden). Environmental Toxicology Group. C. Ramel.

In: Mercury in the Environment, (Chemical Rubber Co. Press), p 169-181, 1972, 3 fig, 9 tab.

Descriptors: *Mercury, *Cytological studies, *Biochemistry, *Chromosomes, *Genetics, Metals, Environmental effects, Toxicity, Animal physiology, Plant physiology, Metabolism. Identifiers: *Cell division, Sub-lethal effects.

The genetic activity of mercury compounds is discussed with primary consideration given to effects on cell division, radiomimetic effects and effects on meiosis. All mercury compounds studied cause c-mitosis, an inactivation of the spindle fiber mechanism at cell division, similar to the effect of colchicine. Increased dosage of mercury results in a gradual series of transitions between normal and c-mitotic division, giving more variable chromosome numbers. Mercaptans act as inhibitors against the c-mitotic action of organomercury compounds. Organic mercury compounds also act directly upon the genetic material. Chromosome breakage resulting from these compounds is independent of c-mitotis. Cytological observations revealed that methyl mercury induced inactivation of the spindle fibers during meiosis, resulting in chromosomal effects corresponding to those in-duced at mitosis. The fact that mercurials act on basic genetic systems justifies the assumption of the same effect in different organisms as long as the compound reaches the target molecules. (See also W74-07680) (Jerome-Vanderbilt) W74-07688

GENERAL DISCUSSION AND CONCLUSIONS-NEED FOR FURTHER RESEARCH, Karolinska Institute, Stockholm (Sweden). Dept.

Nationiska institute, Stockholm (Sweden). Dept. of Environmental Hygiene.
L. Friberg, and J. Vostal.
In: Mercury in the Environment, (Chemical Rubber Co. Press), p 183-186, 1972.

Descriptors: *Mercury, *Environmental effects, *Toxicity, *Research priorities, Air pollution, Water pollution, Metals, Metabolism, Reproduction, Growth rates, Biochemistry, Animal pathology, Organic compounds, Inorganic compounds, Genetics, Analysis, Laboratory tests, Evaluation, Projects.

The increasing amounts of mercury and mercury compounds in the environment can constitute a serious health problem. Of the different types of

mercury, alkylmercury compounds must be considered the primary hazard. Monomethylmercury and monoethylmercury are highly toxic, giving rise to severe damage to the central nervous system. Organic mercury compounds are highly active genetically. Differences in toxicity of mer cury compounds can be explained in terms of metabolism. Methylmercury and ethylmercury have considerable stability in the body, while other forms are transformed into mercuric mercury. The distribution of mercury in the body is af-fected by biotransformation. Dose-response relationships are not known for most exposure situations. The concentration of mercury in hair in rela-tion to mercury in blood in man is about 300:1, corresponding to about 60 micrograms/g hair as a critical concentration. Increased research is needed on dose-response relationships with particular attention to subclinical effects. (See also W74-07680) (Jerome-Vanderbilt)

LIVER ZINC IN CARCINOMA,

Whittington Hospital, London (England). Dept. of Chemical Pathology. E. B. Wright, and T. L. Dormandy. Nature, Vol 237, No 5351, p 166, May 19, 1972, 2

tab. 16 ref.

Descriptors: *Cytological studies, *Disease resistance, *Zinc, Biochemistry, Pathology, Diseases, Microbiology, Heavy metals, Analytical techniques, Bioindicators, Spectroscopy. Identifiers: *Carcinoma.

The relationship of zinc to malignant disease was investigated through the examination of samples of liver tissue from 50 necropsies, using atomicabsorption spectroscopy, microscopic examina-tion, and wet weight/ash ratio. The samples came from fatty livers, normal livers, apparently uninvaded livers from organs containing secondary malignant deposits, and livers from patients with malignant disease but no obvious liver secondaries, and they were compared on parts per million zinc content. The carcinomatous deposits themselves had a low zinc concentration, while in or-gans harboring such deposits an abnormally high zinc concentration was found. The high concentra-tions of zinc in unaffected liver tissue of subjects nons of zinc in unaffected liver tissue of subjects with carcinoma is suggested to be a defense reaction to invasion by malignant cells. The accumulation of zinc could be useful in the interpretation of liver biopsy material. (Jerome-Vanderbilt) W74-07690

THE DISTRIBUTION OF LEAD IN HUMAN

DECIDUOUS TEETH, Harvard Medical School, Boston, Mass. K. G. Carroll, H. Needleman, O. C. Tuncay, and I. M. Shapiro.

Experientia, Vol 28, No 4, p 434-435, 1972. 1 fig, 4 ref. PHS DE 02623.

*Lead. *Human pathology, Descriptors: Descriptors: "Lead, "Human pathology, "Distribution, "Toxicity, Human diseases, Toxins, Heavy metals, Metals, Pathology, Environmental effects, Air pollution, Public health. Identifiers: "Human teeth, Teeth, Poisoning, Lead

pollution.

Lead absorbed into the body by various routes is stored in teeth and bone. Substantial increases in the lead content of deciduous teeth of children dying of lead poisoning have been demonstrated. Asymptomatic children from areas where lead poisoning is frequent have significantly higher lead levels in shed deciduous teeth than controls from areas in which lead poisoning is unknown. This suggests that the deciduous tooth may provide a means of identifying lead ingestion long after the ingestion has stopped. This preliminary report describes the use of the electron probe in the study of the distribution of lead in human dental tissues, and verifies some of the existing hypotheses. (Oleszkiewicz-Vanderbilt) W74-07691

POLYACRYLAMIDE GEL DISC ELECTROPHORESIS OF RAT BILE AFTER INTRAVENOUS ADMINISTRATION OF 52 MNC12, PB(N03)2, 64CUC12, 203HGC12 AND

Institute of Industrial Hygiene and Occupational Diseases, Prague (Czechoslovakia). M. Cikrt, and M. Tichy.

Experientia, Vol 28, No 8, p 383-384, 1972. 1 fig, 17 ref

Descriptors: *Metabolism, *Heavy metals, *Proteins, *Rodents, Biochemistry, Copper, Manganese, Lead, Mercury, Physiology, Chemical *Metabolism, properties, Chemical reactions, Semipermeable membranes, Laboratory tests, Analytical techniques. Identifiers: Rat liver bile.

The reactions of copper, manganese, lead and mercury with liver bile are used in an attempt to explain why copper and manganese are excreted rapidly while lead and mercury are retained. The investigation focuses on the fact that in biological systems quite a number of proteins are known to bind metals. Using polyacrylamide gel disc electrophoresis, the protein spectrum of rat bile was compared with the location of 210Pb, 52Mn, 64Cu, and 203Hg on the electrophoreogram. With mercury, the radioactivity existed predominantly in the prestacking gel zone containing high-molecular bile specific protein. In the cases of both Mn (++) and Cu (++) the radioactivity appeared mostly in the region of the pigment zone. The maximum amount of Pb (++) was found in the post-albumin zone. The more rapid excretion of Mn (++) and Cu (++) into the bile could be explained by formation of relatively small complexes of these metals which may penetrate through membranes more rapidly than complexes of Hg (++) and Pb (++) which are predominantly bound to proteins of greater molecular weight. (Jerome-Vanderbilt) W74-07694

THE ENVIRONMENTAL CONTEXT,

Connecticut Univ., Storrs

T F Malone

EOS Transactions American Geophysical Union, Vol 52, No 7, p 508-512, July 1971, 1 fig.

Descriptors: *Environmental control, *Water pol-lution, *Air pollution, *Land use, *Legislation, Pesticides, Pesticide toxicity, Eutrophication, Heavy metals, Trace elements, Oil, Natural resources. Environmental effects.

There are basically three problems of the human environment: (1) Pollution of air, water and land; (2) Land use and misuse; and (3) Exploitation of natural resources. Several examples of threats to the environment are presented: (1) increasing con-centrations of chlorinated hydrocarbons; (2) accumulation of toxic heavy metals; (3) increase of car-bon dioxide in the air; (4) particle load in the air; (5) 2 million tons of oil released to the ocean annually; (6) biostimulation of lakes; (7) population displacement; and (8) finite character of the world's natural resources and their uneven utilization. A discussion of indispensable international action is included. (Oleszkiewicz-Vanderbilt) W74-07696

METALS FOCUS SHIFTS TO CADMIUM, For primary bibliographic entry see Field 5B. W74-07697

THE INFLUENCE OF TEMPERATURE AND TO THE FIDDLER CRAB, UCA PUGILATOR, South Carolina Univ., Columbia Belle W. Baruch Coastal Research Inst. I O'Hara

Fishery Bulletin; Vol 71, No 1, p 149-153, 1973, 2 fig. 1 tab. 12 ref.

Group 5C-Effects Of Pollution

Descriptors: *Cadmium, *Temperature, *Salinity, Descriptors: "Caumitum, Telisperature, Gammer,
"Crabs, "Toxicity, Lethal limit, Environmental effects, Water pollution effects, Heavy metals,
Thermal collution Marine animals, Animal Thermal pollution, Marine animals, Animal pathology, Bioassay, Animal diseases, Pathology. Identifiers: *Fiddler crabs, Accumulation.

The concentrations of cadmium lethal to the fiddler crab, Uca pugilator, were determined for various environmental regimes of temperature and salinity. Mortality was greatest in high temperatures and low salinities when tested for 240 hr. The concentration fatal to 50% of the organisms in 240 hours was 2.9 ppm Cd (++). Concentrations of cadmium determined by use of radioactive cadmium were greatest in green gland followed by gill, hepatopancreas, and muscle. No differences peared between results from males and from females. The rapid accumulation of cadmium from the surrounding water results in considerable tisthe first 24 (Oleszkiewicz-Vanderbilt) hours. W74-07699

THE LD(50) VALUE OF TETRAETHYL LEAD, Colorado State Univ., Fort Collins. Dept. of Zoology.

T. Schroeder, D. D. Avery, and H. A. Cross Experientia, Vol 28, No 4, p 425-426, 1972. 8 ref.

Descriptors: *Lead, *Toxicity, *Bioassay, *Laboratory animals, *Lethal limit, Toxins, Heavy metals, Metals, Environmental effects, Animal pathology, Pathology. Identifiers: *Tetraethyl lead, Lead pollution,

Clinical studies.

Toxicity studies on laboratory animals treated with tetraethyl lead are described. The mortalities which resulted were 1 of 4 at 10.0 mg/kg, 0 of 4 at 13.0, 4 of 4 at 16.9 and 4 of 4 at 21.97. The mortality data were then matched to Weil's tables. All animals displayed neurological signs of the initial phase beginning the second day. Violent move-ment and aggression represented the second stage. Convulsions and death in stage three occurred around the sixth day with progressive stages occurring faster in animals receiving higher doses. The LD(50) and its confidence interval can thus be estimated as 14.18 (12.62 to 15.93) mg/kg. See also W74-07701) (Oleszkiewicz-Vanderbilt) W74-07700

TETRAETHYL LEAD DOSE RESPONSE CURVE FOR MORTALITY IN LABORATORY

Colorado State Univ., Fort Collins, Dept. of Zoology.

T. Schroeder, D. D. Avery, and H. A. Cross. Experientia, Vol 28, No 8, p 923-924, 1972. 1 fig, 1

Descriptors: *Lead, *Toxicity, *Bioassay, *Laboratory animals, Toxins, Heavy metals, Metals, Environmental effects, Lethal limit, Animal pathology, Pathology. Identifiers: *Mortality, Tetraethyl lead, Lead pol-

lution, Clinical studies.

This step in the research follows previously described work on finding the LD(50) value of tetraethyl lead, and represents an assessment of the dose response curve for single dose, oral administration for a standard 14 day period. As in the previous research, 3 stages in the progress of the previous research, 'stage I: lethargy; Stage II: aggression and thrashing, and Stage III: convulsions and, in higher dosages, death. An interesting phenomenon observed in the third stage of the dis ease was that 14 of the animals exhibited self-can-nibalization of the feet and tail. The LD(50) value (11.50-13.16 mg/kg) was found to be lower than previously believed. (See also W74-07700) (Oleszkiewicz-Vanderbilt) EVALUATION OF ZINC AVAILABILITY IN FOODSTUFFS OF PLANT AND ANIMAL

ORIGIN, Missouri Univ., Columbia. Dept. of Agricultural Chemistry

Journal of Nutrition, Vol 102, No 5, p 653-660, 1972. 2 fig, 5 tab, 19 ref.

Descriptors: *Birds, *Rodents, *Zinc, *Diets, *Absorption, Biochemistry, Physiology, Laboratory tests, Metabolism, Measurements, Evalua-Growth rates, Nutrients, Protein, Carbohydrates.

Growth response of chicks and rats was used to evaluate the biological availability of zinc in selected cereal grains and animal products. Two sources of protein, soybean and casein-gelatin, were used in the basal low zinc diets and graded levels of ZnCO3 were added to establish the standard response curve. Thus, the availability values are based on the assumption that 100% of the zinc in ZnCO3 is available. A plot of weight gain during a 4-week period versus the logarithm of zinc added gave a straight line relationship over the range of 3 to 12 ppm. The 5 to 10 ppm range was used to evaluate the supplements which were added to the basal diets in lieu of carbohydrate. The minimum zinc requirement for chicks and rats fed the soybean diets was 19 ppm and for chicks fed the casein-gelatin diet it was 12 ppm. Chick and rat assays obtained biological availability for a number of food substances. In general the zinc in plant seeds was less available than that in animal products, and rats utilized the zinc in plant seeds less well than chicks. (Jerome-Vanderbilt) W74-07706

EFFECT OF ASCORBIC ACID ON CADMIUM TOXICITY IN THE YOUNG COTURNIX,

Food and Drug Administration, Washington, D.C. Div. of Nutrition.

M. R. S. Fox, B. E. Fry, Jr., B. F. Harland, M. E. Schertel, and C. E. Weeks. Journal of Nutrition, Vol 101, No 10, p 1295-1306, 1971. 6 tab, 33 ref.

*Metabolism. Descriptors: *Cadmium. *Absorption, *Game birds, *Toxicity, Biochemistry, Physiology, Nutrients, Diets, Laboratory tests, Deficient elements, Bioassay, Evaluation, Heavy metals, Zinc, Iron, Copper, Chromium, Cobalt, Inhibitors, Molybdenum, Birds. Identifiers: *Ascorbic acid, *Quail.

To evaluate the effects of dietary supplements in altering the toxicity of dietary cadmium, day-old coturnix (Japanese quail) were fed 75 mg Cd/kg of an adequate purified diet for 2- or 4-week periods. Cadmium produced moderate growth retardation, severe anemia, decreased ash content of the tibia and deviations from the normal concentrations of zinc, iron, cadmium, copper, and calcium in one or more of the cells or tissues assayed (erythrocyte, liver, kidney, and tibia). Dietary supplements of zinc, iron (III), copper, and L-cystein-HCl and injected ascorbic acid produced slight to moderate protection against cadmium-induced anemia, whereas iron (II), ascorbic acid, and D-isoascorbic acid had marked effects in preventing the anemia, growth retardation, poor bone mineralization, and perturbations in elemental concentrations of tissues. Chromium, cobalt, selenium, nickel, molybdenum, and pteroylglutamic acid had no effects. Initiation of ascorbic acid feeding at 2 weeks was beneficial to birds fed cadmium throughout the 4week experiment. Under the conditions of these experiments, cadmium produced a functional iron deficiency and less clear-cut effects on zinc functions. It appears that a primary effect of cadmium was to prevent absorption of dietary iron (III). (Jerome-Vanderbilt) W74-07707 INFLUENCE OF DIETARY AND INJECTED SELENIUM ON WHOLE-BODY RETENTION, ROUTE OF EXCRETION, AND TISSUE RETENTION OF 75SEO3 (--) IN THE RAT,

Army Medical Research and Nutrition Lab., Denver, Colo. R. F. Burk, D. G. Brown, R. J. Seely, and C. C.

Scaief, III. Journal of Nutrition, Vol 102, No 8, p 1049-1056, 1972. 5 fig. 2 tab. 12 ref.

*Rodents. Descriptors: *Metabolism. *Distribution, *Selenium, *Retention, Biochemistry, Physiology, Laboratory tests, Measurement, Evaluation, Heavy metals, Analytical techniques, Diets, Nutrients, Bioassay.

Rats which had been fed a Torula yeast diet with selenium supplements of from 0 (basal) to 1 ppm for 35 days were injected with a tracer dose of 75SeO3 (--). Similar animals, all fed the basal diet, received carrier selenium in the injection at three received carrier selenium in the injection at three levels (20, 50, and 200 micrograms). Whole-body counting was performed at frequent intervals; urine and fecal 75Se were determined for 10 days; and the animals were killed 35 days after injection and tissue retention was determined. Increase of either dietary or carrier selenium decreased whole-body retention of the 75Se in all cases and increased its urinary excretion except in the animals given 200 micrograms of carrier in which volatilization apparently occurred. Fecal excretion was about the same for all groups. Testis, brain, spleen, kidney, small intestine, eye, and thymus spicen, kinney, small intestine, eye, and thymus contained the greatest percentage of the whole-body 75Se when the basal diet was fed. This decreased as dietary selenium was increased. Skeletal muscle and blood showed the opposite pattern. The liver had the smallest percentage of whole-body 75Se in animals fed the basal diet. Supplementation with 0.10 ppm Se almost quadrupled it, but subsequent increases caused it to drop again. (Jerome-Vanderbilt) W74-07708

AERIAL POLLUTION AND THE RAPID EVOLUTION OF COPPER TOLERANCE, Liverpool Univ. (England). Dept. of Botany For primary bibliographic entry see Field 5B.

SENSITIVITY OF VERTEBRATE EMBRYOS TO HEAVY METALS AS A CRITERION OF WATER QUALITY-PHASE I,

Kentucky Univ., Lexington. Water Resources Research Inst. W. J. Birge, J. J. Just, A. Westerman, and A. D.

Rose.

Available from the National Technical Informa-Available 110th Revious 17 Feb. 123 (175; \$3.25 in paper copy, \$1.45 in microfiche. Research Report No 71, 1974. 33 p, 5 tab, 6 fig, 53 ref, 1 plate. OWRR B-028-KY(1). 14-31-0001-3890.

Descriptors: Water quality control, *Heavy metals, Bioindicators, Fish, *Embryonic growth stage, Mercury, Cadmium, Lead, Toxicity, Water quality standards, Lethal limit, Mortality, Trout, Channel catfish, Water pollution effects, Criteria, Amphibians, Metallic poisoning, Methyl mercury, Goldfish, Avian embryos.

Avian, amphibian and fish embryos were given continuous treatment with inorganic mercury, methyl mercury, cadmium and lead, to determine the sensitivity of embryogenesis to metallic poisoning. All metals produced substantial degrees of lethality and/or gross anatomical anomalies at 10 ppb or less. Treatment with inorganic mercury 10 ppb produced 100% kill of frog embryos. Chick and rainbow trout embryos suffered 10-20% lethality when exposed to 1 ppb of either inorganic or methyl mercury. Lead and cadmium at 1 ppb produced 24-32% lethality in chick embryos. No significant differences were observed in the embryopathic effects of inorganic or methyl mercury.

Effects Of Pollution-Group 5C

Concerning toxic effects of mercury, cadmium and lead, the 'embryonic stage' appears to con-stitute the critical 'sensitive link' in the vertebrate life cycle. The reproductive potential of vertebrate populations may be severely restricted (e.g., embryonic mortality) by such pollutants at trace levels which may not prove hazardous to adult animals, and environmental standards based on tolerance levels for adults may not provide adequate protection for sensitive developmental stages. Mercurial sensitivity of the goldfish, channel catfish and trout embryos increased in respective order, correlating with differences in egg size and hatching time of these species. A 50-fold difference in threshold levels was observed between goldfish and more sensitive trout embryos. This positive correlation suggests that fish with larger eggs and/or longer periods of embryological development are more susceptible targets of mercurial poisoning. (Grieves-Kentucky) W74-07715

ENVIRONMENTAL CONTROL OF NITROGEN FIXATION IN LAKES, I. IN SITU NITROGEN FIXATION BY FREE LIVING BLUE-GREEN ALGAE, AND II. NITROGEN FIXATION BY THE DUCKWEED-ALGAL ASSOCIATION, Michigan State Univ., East Lansing. Dept. of Crop and Soil Sciences

J. M. Tiedje, T. P. Duong, and M. Cichowski. Available from the National Technical Information Service as PB-232 085; \$3.25 in paper copy, tion service as Fn-222 ob; \$3.23 in paper copy, \$1.45 in microfiche. Michigan Institute of Water Research, East Lansing, Completion Report, (March 1974). 35 p, 12 fig, 7 tab, 44 ref. OWRR A-046-MICH(1). 14-31-0001-3222.

*Michigan, *Cyanophyta, Descriptors: *Eutrophication, *Nitrogen fixation, Algae, Anabaena, Nostoc. Identifiers: *Wintergreen Lake(Mich), *Acetylene Algal reduction, Duckweeds, growth, Spirodela, Gloeotrichia. Lemma. Aphanizomenon

In situ acetylene reduction studies in hypereutrophic Wintergreen Lake showed that nitrogen fixation occurred from early July until mid-August and was correlated with the presence of heterocyst-bearing blue-green algae.

Aphanizomenon was the dominant nitrogen fixing organism in 1970 while Anabaena was dominant in 1971; the Anabaena bloom resulted in 10 times more fixation than the Aphanizomenon bloom. Significant acetylene reduction was limited to the euphotic zone (0-3 m). Acetylene reduction at night was significant and for Aphanizomenon was greater than during the day. For the Anabaena bloom, maximum fixation occurred at 1 and 2 meter depths and was inhibited at the surface by high light intensities. Inorganic nitrogen was not detectable in the lake waters during the bloom period. The estimated nitrogen addition to the lake by fixation was 21 kg NH3/ha for the 1971 bloom. The duckweeds Lemna and Spirodela were found to have a commensalistic relationship with bluegreen algae that resulted in significant nitrogen fixation. Acetylene reduction by this association was widespread as it occurred in 27 of 30 sample sites over 3 years (1971-1973). Quantities of nitrogen fixed averaged 4 to 7 kg/ha per season but could range up to 10 times higher when Lemna trisulca was the dominant host plant. The associated heterocyst-bearing algae were Nostoc, Gloeotrichia and Anabaena. They were found either in reproductive pockets or attached to the lower mesophyll. Plant excreted nutrients, an attachment surface and shading appeared to favor the algal colonization of this niche. The quantities of nitrogen fixed could represent major sources of nitrogen particularly for shallow and/or intermittent bodies W74-07716 s of water.

AN INVESTIGATION OF THE WATER QUALI-TY AND PRODUCTIVITY OF POLSON BAY, FLATHEAD LAKE, MONTANA,

Montana Univ., Missoula. Dept. of Zoology.

A. R. Gaufin.

Available from the National Technical Information Service as PB-232 119; \$3.00 in paper copy, \$1.45 in microfiche. Montana Water Resources Research Center, Bozeman, Completion Report No. 48, (1974), 14 p. OWRR A-043 MONT(1).

Descriptors: *Phytoplankton, *Zooplankton, *Lakes, *Thermal stratification, *Carbon radioisotopes, *Montana, Water quality, Biomass, *Primary productivity, Nutrients, Pollutary identification.

Zooplankton and phytoplankton collections were taken in Polson Bay at the lower end of Flathead Lake, Montana, and a biomass estimate obtained. Exchange of nutrients with bottom sediments was measured, particulate matter in the water was analyzed for carbon and ash-free dry weight, and the gross primary productivity of Flathead Lake was measured by means of the carbon 14 method. Thermal stratification occurred at only a few locations in Flathead Lake. Nutrients and dissolved solids, although normally at low concentrations, were usually sufficient to support the growth of phytoplankton. Most components increased in concentration during the summer months. Coliform were almost non-existent in Polson Bay. (Williams-Montana)

SURVIVAL OF INTESTINAL BACTERIA IN OLIGOTROPHIC WATERS, Washington State Univ., Pullman. Dept. of Civil

and Environmental Engineering.

D. L. Johnstone, and A. M. Kubinski.

Available from the National Technical Information Service as PB-232 156, \$3.25 in paper copy, \$1.45 in microfiche. State of Washington Water Research Center, Pullman, Completion Report No 14, July 1973. 29 p, 11 fig, 4 tab, 26 ref. OWRR A-048-WASH(1), 14-31-0001-3848.

*Protozoa. *Periphyton, Descriptors: Oligotrophy, *Coliforms, *Bacteria, *Streptococcus, Aquatic plants, *Washington, Physicochemical properties, Water pollution ef-Identifiers: Predator-prey relationships, Indigenous bacterial flora.

Direct predator-prey relationships involving a few species of ciliated and flagellated protozoans from the periphyton of oligotrophic waters appear to be the major mechanism in such environments responsible for removal of fecal bacteria. Other factors, such as the indigenous bacterial flora and the physicochemical properties of these waters, are relegated to a more indirect role. The lengthy lag period (4-5 days) required for initial predatory responses indicates the delicate nature of highquality waters and the need for strict sanitary guidelines to ensure their future safety and quality. The sanitary quality of oligotrophic waters can best be determined by the enumeration of fecal streptococci in conjunction with fecal coliforms. W74-07737

STUDIES ON SOUTHEASTERN AQUATIC IN-

Georgia Univ., Athens. Dept. of Entomology. J. B. Wallace.

Available from the National Technical Information Service as PB-232 183, \$9.75 in paper copy, \$1.45 in microfiche. Environmental Protection Agency, Report EPA 660/3-73-016, May 1974. 131 p, 15 fig, 20 tab, 87 ref. EPA Project 18050 DFQ.

Descriptors: *Aquatic insects, *Systematics, Ecology, Caddisflies, Insects, Distribution, Water quality, Insecticides, Insect resistance, Nutrients,

Feeding rates, *Southeast U.S., *Dieldrin, *Stoneflies, Standing crops, Biomass, Appalachian mountain region, Chlorinated hydrocarbon pesticides, Pesticide residues, Water pollution effects.

Identifiers: *Trichoptera, *Savannah River basin, Hydropsychidae.

This report is concerned with taxonomic studies of adult and immature Trichoptera in the southeast and several aspects of the ecology and distribution of southeastern aquatic insects. The distribution of the family Hydropsychidae in the Savannah River basin in relation to water quality parameters was studied. The effects of prolonged exposure to a chlorinated hydrocarbon insecticide, dieldrin, and its effect on aquatic insect populations and residue levels are discussed. The feeding habits and feeding rates of an herbivorous stonefly were studied as well as the effect of such feeding on water quality-such as increased leaching from leaves as a result of insect feeding. In conjunction with the preceding laboratory experiments, an extensive study was carried out on the benthic fauna of four small streams of various plant cover types (Hardwood, Coppice Hardwood, White Pine and Pasture) in the southern Appalachians. The pine stream had lowest diversity and standing crop biomass, whereas the coppice had greatest stand-ing crop biomass. Wholebody and standing crop of calcium, potassium and magnesium were also stu-died in the above streams. (EPA) W74-07740

ACCUMULATION PHENOMENON WHICH TAKES PLACE IN A MUSSEL (MYTILUS GAL-LOPROVINCIALIS LMK) GROWN IN AN AR-TIFICIALLY POLLUTED ENVIRONMENT, VERIFICATION OF A SIMPLIFIED MODEL OF THE DYNAMIC EQUILIBRIUM OF METAL RIPARTITION BETWEEN MUSSELS AND SEA-RIPARTITION BETWEEN MUSSELS AND SEAWATER, NOTE IL-POLLUTION FROM
COPPER, (FENOMENO DI ACCUMULO NEL
MITILO (MYTILUS GALLOPROVINCIA-LIS
LMK) STABULATO IN AMBIENTE ARTIFICIALMENTE INQUINATO. VERIFICA DI UN
MODELLO SEMPLIFICATO PER L'EQUILIBR DINAMICO DI RIPARTIZIONE METALLI FRA MITILO E ACQUA MARINA, NOTA II: INQUINAMENTO DA RAME).

L. Majori, and F. Petronio. L'Igiene Moderna, Vol 66, No 1, p 64-78, January-February, 1973. 7 fig, 3 tab, 31 ref, (English sum-

Descriptors: Investigations, Evaluation, Metals, *Water pollution sources, *Mussels, *Bioindicators, Model studies, *Copper, Heavy Identifiers: *Bioaccumulation.

Research consisting of the evaluation of the potential damage due to pollution by metals using as the biological indicator, mussels, and its capability to act as a local pollution warning-signal, is ex-plained. Such evaluations are quantified by the use of a dynamic kinetic model of the metal division between mussel and water. Results of experimen-tal research show mussel ability to accumulate copper in polluted waters thus confirming afore-mentioned research purposes. (Sandoski-Franklin) W74-07746

RESULTS OF RED TIDE FORMATION IN

TOKYO BAY, Tokyo Univ. (Japan). Faculty of Science.

T. Tsuji, H. Seki, and A. Hattori.

Journal Water Pollution Control Federation. Vol. 46, No 1, p 165-172, January 1974. 6 fig, 2 tab, 9

Descriptors: *Eutrophication, Investigations, Coasts, Hypolimnion, *Phytoplankton, *Red tide, requirements, *Degradation(Decomposition), Bays, conditions, *Stratification.
Identifiers: *Japan(Tokyo Bay).

Group 5C-Effects Of Pollution

The status of eutrophication in Tokyo Bay was investigated from August 1971 to May 1972 with special attention given to the formation of a microaerobic zone. This zone appeared in the bottom layer in the region of a gyre of the coastal water in the inner part of the bay, after the occurrence of the red tide caused by phytoplankton. On the basis of measured oxygen consumption rates, it is suggested that the multiple crops of phytoplankton in a red tide are transported downward to the bottom layer before their easily decomposable fraction has been decomposed in the upper layers. (Sandoski-Franklin)

SEASONAL AND SPATIAL CHANGES IN PRI-MARY PRODUCTION AND NUTRIENTS IN

LAKE MICHIGAN,
Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.

D. C. Rousar.

Water, Air, and Soil Pollution, Vol 2, No 4, p 497-514, December 1973, 17 fig, 1 tab, 31 ref.

Descriptors: *Primary productivity, *Sampling, Wisconsin, Michigan, *Nutrients, Phytoplankton, Seasonal, Plant physiology, Physical properties, Chemical properties, Conductivity, Phosphorus, Silica, *Lake Michigan, Temperature, Hydrogen ion concentration, Nitrates, *Eutrophication,

Plant growth. Identifiers: Carbon uptake, Plant pigments, Phenolphthalein alkalinity.

Samples were collected from a railroad ferry between Wisconsin and Michigan over a period of 17 months to determine the spatial and temporal distribution of primary production and several physical and chemical variables. Conductivity, silica, total phosphorus, soluble reactive phosphorus, plant pigments, and carbon uptake exhibited inshore-offshore differences, and all but silica were highest at the Wisconsin inshore station, thus suggesting nutrient enrichment of Lake Michigan by Milwaukee. Temperature, pH, phenolphthalein alkalinity, nitrate, silica, plant pigments, and C uptake showed varying degrees of seasonal change. A bimodal seasonal abundance of phytoplankton was revealed. (Sandoski-W74-07773

A NOTE CONCERNING THE ENVIRONMEN-TAL ACCEPTABILITY OF NITRILOTRIACETIC ACID (NTA): THE EFFECT OF NTA ON THE GROWTH OF GYM-NODINIUM BREVE,

University of South Florida, Tampa. Dept. of Chemistry.

M. T. Doig, and D. F. Martin.

Environmental Letters, Vol 6, No 1, p 31-36, 1974. 1 tab, 12 ref.

*Nitrilotriacetic Descriptors: "Gymnodinium, *Analytical techniques, Domestic wastes, *Eutrophication, Toxicity, *Growth rates. Identifiers: Lag time, Growth constant, Mean generation time, Maximum cell count.

The effect of NTA on the growth of Gymnodinium breve was determined by a modification of the flask test. The response of G, breve to enrichment of natural waters with NTA alone or NTA in the presence of domestic waste materials was evaluated in terms of the following four growth parameters: lag time, growth constant, mean generation time, and maximum cell count. NTA was not toxic to G. breve at concentrations up to 10 ppm and no biostimulatory effects were noted. (Sandoski-Franklin)

THE USE OF ALGAL ASSAYS FOR DETER-MINING THE EFFECT OF IRON AND

GROWTH OF VARIOUS ALGAL SPECIES. **PHOSPHORUS** Wahnbachtalsperrenverband, Siegburg (West Ger-

J. Clasen, and H. Bernhardt.

Water Research, Vol 8, No 1, p 31-44, 1974. 16 fig, 7 tab. 58 ref.

Descriptors: *Eutrophication, *Algae, Water samples, Testing, Fertility, Filtra-tion, *Iron, *Phosphorus, Growth rates, *Algal control, *Productivity. Identifiers: Algal growth.

Algal assays were performed with unialgal cultures to determine the productivity of the water samples tested. The productivity of the water samples rich in turbid materials and algae was higher in heat sterilized samples than those prepared by filtration. There is a clear correlation between the productivity of unfiltered sterilized water samples and their iron and total phosphorus content. Assays proved that the large decrease in productivity is due chiefly to the removal of phosphorus com-pounds and the removal of iron and other unknown substances. There are indications that the amount of iron required for growth, as compared with that of phosphorus, varies greatly depending on the individual algal species. The significance of the algal assay and the results relating to measures for limiting eutrophication using phosphorus removal plants are discussed. (Sandoski-Franklin) W74-07776

INORGANIC NITROGEN REMOVAL IN A COMBINED TERTIARY TREATMENT-MARINE AQUACULTURE SYSTEM - II. ALGAL BIOASSAYS,

Woods Hole Oceanographic Institution, Mass. J. C. Goldman, K. R. Tenore, and H. I. Stanley Water Research, Vol 8, No 1, p 55-59, 1974. 3 fig, 2

Descriptors: *Waste water treatment, *Bioassays, Sampling, *Tertiary treatment, Discharge(Water), *Nitrogen, *Algal control, Waste water(Pollution), Identifiers: Algal growth, *Combined treatment,

Algal bioassays, conducted on samples from various components of the combined tertiary treatment-marine aquaculture process, demonstrated that nitrogen removal is necessary to prevent increasing the algal growth potential of coastal marine waters receiving wastewater discharges. When nitrogen was removed from secondarily treated domestic wastewater, the wastewater in varying dilutions with seawater could not support more algal growth than the seawater alone. By adding nitrogen back to the treated wastewater the algal growth potential was increased to that of the untreated wastewater. This was demonstrated by assaying samples containing both artificially added nitrogen and nitrogen regenerated by oysters. Assays of the effluent from the seaweed system showed that the removal of regenerated nitrogen reduced the algal growth potential to that of natural seawater. (Sandoski-Franklin) W74-07777

EXPERIMENTAL STUDY OF THE HAZARD DUE TO CHLORINATED QUINONES AND THEIR SAFETY LEVELS IN WATER BODIES (IN RUSSIAN). Institut Gigieny Truda i Profzabolevanii, Ufa

(USSR).

V. G. Murzakaev, and Z. V. Latypova. Gig Sanit, Vol 37, No 5, p 15-19, 1972, Illus, En-

glish summary. Identifiers: *Chloranil, *Chlorinated hydrocar-*Quinones, it, Toxicity bons, *Organoleptic properties, *6 Safety, Potable water, Lethal limit, index, Public health, Water pollution effects.

A study was done on the hazard due to certain chlorinated quinones and their safety levels in water bodies. The introduction into a water body of tetrachlorhydroquinone (TCHC) had a noxious effect responsible for deterioration of the organoleptic properties of the water. In a water body intended for human drinking and recreation the content of chloranil is permissible within the level of 0.05 mg/l and that of TCHC within the level of 0.5 mg/l. Their sanitary toxicological effects may serve as index of their noxious action .-- Copyright 1973, Biological Abstracts, Inc.

ENVIRONMENTAL EFFECTS OF THE CONSTRUCTION AND OPERATION OF A GASE-

STRUCTION AND OPERATION OF A GASE-OUS DIFFUSION PLANT. Goodyear Atomic Corp., Portsmouth, Ohio. Available from NTIS, Springfield, Va., as Rept. No. ORO-725; \$4.00 per copy, \$1.45 microfiche. Report No ORO-725, July 1973.

Descriptors: *Nuclear energy, *Energy conversion, *Radioactivity, *Environmental effects, Effluents, Water pollution, *Ohio River, Uranium, Biology, Balance of nature, Ecology, Pollutants, Measurement, Assay, Assessment, Safety, Evaluation, Public health, Operations, Regulation. Identifiers: *Gaseous diffusion plant, Portsmouth(Ohio).

Described are the impacts upon the environment resulting from construction, start-up, and operation of a gaseous diffusion plant. Some of the impacts are typical regardless of location of the plant. Others are atypical and depend upon location; those are presented, by way of example, as they occur at the Portsmouth Gaseous Diffusion Plant. The various environmental contaminants that may be produced in the operating plant are described. The concentrations of those contaminants are stated; and the adverse biological effects of pertinent contaminants are elucidated. The en-vironmental impact of the plant varies somewhat according to U-235 concentrations. However, commercial plants are not expected to enrich U-235 in concentrations greater than 4%; for this reason, environmental effects due to Portsmouth operations within that range are emphasized. The study revealed that present discharges from the plants generally have no detrimental effects upon the environment. (Houser-ORNL) W74-07781

ENVIRONMENTAL RADIOACTIVITY. New York Univ. Medical Center, N.Y. Inst. of Environmental Medicine. For primary bibliographic entry see Field 5B. W74-07791

ENVIRONMENTAL STATEMENT RELATED TO CONSTRUCTION AND OPERATION OF BARNWELL NUCLEAR FUEL PLANT. Directorate of Licensing, Fuels and Materials (AEC), Washington, D.C. For primary bibliographic entry see Field 5B. W74-07792

FINAL ENVIRONMENTAL STATEMENT RE-POWER PLANT, UNITS 1 AND 2.
Directorate of Licensing (AEC), Washington,

For primary bibliographic entry see Field 5A.

IODINE-129 LEVELS IN MILK AND WATER NEAR A NUCLEAR FUEL REPROCESSING PLANT,

York State Dept. of Health, Albany. Radiological Sciences Lab. For primary bibliographic entry see Field 5B.

Effects Of Pollution—Group 5C

RADIONUCLIDES IN ECOSYSTEMS, VOLUME

Oak Ridge National Lab., Tennessee. Available from NTIS, Springfield, Va., as CONF-710501, Proceedings, Vol. II, \$13.60 per copy, \$1.45 microfiche. Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971. Oak Ridge, Tennessee, D. J. Nelson, Editor. Report CONF-710501-P2, (1971). 678 p.

Descriptors: *Ecosystems, *Radioecology, *Radioisotopes, Ecology, *Radioactivity, *Path of pollutants, Environmental effects, Assay, Measurement, *Water pollution effects.

Contents of Volume II are divided into four parts: Radionuclides in Marine Ecosystems; Models of Radionuclides in Ecosystems; Effects of Ionizing Radiation on Plants and Plant Communities; and Effects of Ionizing Radiation on Species and Populations. (See also W74-07800 thru W74-07825) W74-07799

PLUTONIUM IN NORTH ATLANTIC OCEAN ORGANISMS: ECOLOGICAL RELATION-SHIPS.

Woods Hole Oceanographic Institution, Mass. V. E. Noshkin, V. T. Bowen, K. M. Wong, and J. C. Burke

In: CONF-710501 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971. Oak Ridge, Tennessee, p 681-688, (1971). 1 fig, 2 tab, 20 ref.

*Plutonium, Descriptors: *Atlantic Ocean, Radiostotopes, *Aquatic life, *Ecology, Aquatic environment, *Assay, Analytical techniques, Radiochemical analysis, Fallout, Absorption, Diets, Nutrients, Toxicity, Sediments, Trophic level, Balance of nature, Ecosystems.

A series of North Atlantic Ocean organisms have been analyzed, by radiochemistry and alpha spec-trometry, for fallout plutonium-239, -240, and -238. Organisms from the near-shore environment have been selected to show the effects on plutonium uptake of variations in feeding habits, association with sediment or with absorptive surfaces, and of trophic level. In general, plutonium concentrations are higher in organisms feeding on sediment or on surfaces than in those drawing largely on the water itself. There is some evidence that plutonium concentrations are higher in organisms of higher trophic levels. (See also W74-07799) (Houser-ORNL) W74-07800

DISTRIBUTION OF ZN, FE, MN, AND SR IN MARINE FISHES OF DIFFERENT FEEDING HARITS

Puerto Rico Nuclear Center, Mayaguez.

R. Y. Ting.
In: Conf-710501-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee. p 709-720, (1971) 4 fig, 5 tab, 16 ref.

Descriptors: *Radioisotopes, *Zinc, *Iron, *Manganese, *Strontium, *Fish diets, Foods, Absorption, Sediments, Gulfs, *Puerto Rico, Speciation, Diatoms, Detritus, Algae, Biology, Biological membranes, Bioindicators.
Identifiers: Dietary habit, *Gulf of Panama, Body

The levels of Zn. Fe. Mn. and Sr concentrations in the muscle, viscera, skin, scales, and bone of seven species of fish with four different feeding habits were determined by means of atomic absorption spectrophotometry. Samples were taken from the Gulf of Panama and Puerto Rican waters and included herbivores and carnivores of three distinctly different feeding habits. These were herbivorous, mullet (Mugil curema Valenciennes); plankton feeders, Pacific thread herring (Opisthonema libertate Gunther) and Atlantic thread herring (Opisthonema oglinum LaSueur); benthic carnivorerous, sea trout (Cynoscion reticulatus Jordan and Evermann) and sand nerch (Diplectrum euryplectrum Jordan and Evermann): pelagic carnivores, yellowfin tuna (Thunnus al-bacares Bonnaterre) and skipjack tuna (Euthynnus pelamis Linnaeus). There were no significant dif-ferences in the levels of Zn, Fe, Mn, and Sr con-centrations in the muscle, viscera, skin, scales, and bone in the seven species of fish composed of four different feeding habits, except that the levels of Fe in the viscera were significantly different. The viscera of the herbivores, mullets, contained a significantly higher amount of Fe than the carnivores. This probably was due to the sediments ingested with diatoms, detritus, and algal matter when mullets are feeding from the bottom. The levels of the elemental concentrations in all body parts often varied to significant degrees between species within the same feeding habits. (See also W74-07799) (Houser-ORNL)

RADIOECOLOGY OF THE PLAICE (PLEURONECTES PLATESSA L) IN THE

MORTHEAST IRISH SEA,
Ministry of Agriculture, Fisheries, and Food,
Lowestoft (England). Fisheries Radiobiological

R. J. Pentreath, D. S. Woodhead, and D. F.

In: Conf-710501-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee. p 731-737, (1971) 5 fig, 5 tab, 15 ref.

Descriptors: Effluents, *Nuclear powerplants, Cesium, Fish, Absorption, Foods, Fish diets, Biology, Bioindicators, Model studies, Ruthenium, Cerium, Zirconium, Niobium, Silts, Soils, Sediments, *Radioecology.

Identifiers: *Windscale plant, *Irish Sea, *Plaice.

Of the radionuclides discharged from the UKAEA fuel processing plant at Windscale only Cs-134 and Cs-137 are accumulated to any extent in the flesh of the plaice (Pleuronectes platessa L.). A study of the roles of food and water uptake of Cs-137 by Igroup fish, which remain inshore throughout the summer, showed that approximately 50% is derived from each. The relationship between dietary changes and the contribution of food to the Cs-137 body burden has been examined by monthly sampling of the gut contents of the plaice and the benthic fauna of the Windscale area. The internal radiation dose rates to the gonads of Igroup plaice from the Cs-137 body burden and other radionuclides present in the gut have been calculated using a simple model. As a large proportion of the Windscale radioactive waste, particularly Ru-106, Ce-144, and Zr-95/Nb-95, is reconcentrated on the seabed silt, demersal fish may receive an external radiation dose which is significantly greater than natural background. In situ measurements of such external dose rates received by larger plaice have been made with lithium fluoride dosimeters, and the results largely substantiate calculations based on seabed radioactivity levels. (See also W74-07799) (Houser-W74-07802

CONCENTRATIONS OF MANGANESE, IRON, AND ZINC IN JUVENILES OF FIVE ESTUARINE-DEPENDENT FISHES,

National Marine Fisheries Service, Beaufort, N.C.

F. A. Cross, and J. H. Brooks. In: Conf-710501-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee. p 769-775, (1971) 7 fig, 2

Descriptors: *Estuarine fisheries, Assay, Measurement, *Manganese, *Iron, *Zinc, Fish, Speciation, Juvenile fish, Path of pollutants, Radioisotopes, Cycles, *North Carolina. Identifiers: *Newport River(N.C).

Concentrations of Mn. Fe. and Zn were measured in five species of fish collected from estuarine waters in the vicinity of Beaufort, North Carolina. Concentrations of Mn, Fe, and Zn varied significantly with weight in Atlantic menhaden and Atlantic croaker, and concentrations of Fe and Zn varied significantly with weight in bay anchovy. With the exception of Mn in menhaden, concentrations of trace metals decreased as weight increased. Significant differences among five species (spot, Atlantic croaker, pinfish, bay anchovy, and Atlantic menhaden) were observed for concentrations of Fe and Zn. Concentrations of Mn, however, were very similar among these five species. (See also W74-07799) (Houser-ORNL) W74-07803

IRON-55 AND RUTHENIUM-103 AND -106 IN THE BRACKISH-WATER CLAM RANGIA CU-

NEATA, National Marine Fisheries Service, Beaufort, N.C. For primary bibliographic entry see Field 5A.

TRACE-ELEMENT INTERACTIONS BETWEEN RIVER WATER AND SEAWATER.

Puerto Rico Nuclear Center, Mayaguez For primary bibliographic entry see Field 5B.

TRACE ELEMENTS IN MARINE SHRIMP.

Stanford Univ., Pacific Grove, Calif. Hopkins Marine Station

G. A. Knauer, R. C. Harriss, and W. A. Glooschenko

In: Conf-710501-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee. p 836-839, (1971) 3 fig, 12 ref.

Descriptors: *Shrimp, *Gulf of Mexico, *Water pollution effects, *Radioisotopes, *Absorption, *Food chains, Measurement, Public health, Bioassay, Biology, Habitats, Water pollution sources, Membranes, Manganese, Iron, Zinc, Copper, Magnesium.

The concentrations of manganese, iron, zinc, copper, and magnesium in the exoskeleton, whole body, and abdominal muscles of adult penaeid shrimp were determined. The concentration of the five elements in the exoskeleton samples exhibited extremely wide variability. The freshly shed exoskeleton concentrated significantly higher amounts of all the elements studied, with the exception of copper, than did the newly molted whole-body samples. The concentrations of the five elements in the abdominal muscle samples were in general less than those concentrations found in the exoskeleton or whole-body samples. The calcium carbonate fraction of the exoskeleton is an important carrier for all of the elements investigated except copper. No correlation of shrimp size with element concentration was observed. (See also W74-07799) (Houser-ORNL)

BIOLOGICAL HALF-LIVES FOR ZINC AND MERCURY IN THE PACIFIC OYSTER, CRAS-

SOSTREA GIGAS,
Washington Univ., Seattle. Coll. of Fisheries.
A. H. Seymour, and V. A. Nelson.

In: Conf-710501-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee. p 849-856, (1971) 5 fig, 2 tab, 3 ref.

Descriptors: *Oysters, *Pacific Ocean, *Radioisotopes, *Zinc, *Mercury, *Absorption, Degradation, Biology, Biodegradation, Ion exchange, Cytological studies, Ecology, Food chains, Public health. Identifiers: *Biological half-life, Effective half-life, Physical half-life.

Group 5C-Effects Of Pollution

The biological half-life for zinc was calculated from the rate of loss of Zn-65 by individual oysters. After direct uptake of Zn-65 as ZnC12 in a laboratory aquarium, the marked oysters were returned to their natural habitat and at monthly intervals between January 1969 and March 1971 were returned to the laboratory for Zn-65 mea-surement. Following the first month after uptake, the rates of Zn-65 loss were essentially exponential for two periods, late summer-early fall and the remainder of the year. The average biological halflife values for these periods were 300 and 850 days respectively. The biological half-life for an oyster that lost Zn-65 at a constant rate for the entire experiment was 910 days. The loss of Hg-203 by the oyster was more rapid than the loss of Zn-65. The biological half-life values increased from 5 days to 44 days during the course of the 19-week experiment. For a longer experiment, a longer biological half-life would be expected. Reliable estimates of biological half-life can be calculated from data obtained from long-term experiments with radionuclides unless the values for effective half-life and physical half-life are similar. (See also W74-07799) (Houser-ORNL) W74-07807

ACCUMULATION OF CALCIUM-45 IN DEVELOPING COHO SALMON EGGS AND FRY REARED IN VARYING CONCENTRATIONS OF STABLE CALCIUM,

Washington Univ., Seattle. Coll. of Fisheries. P. R. Olson,

In: Conf-710501-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee, p 866-874, (1971) 7 fig, 2 tab. 22 ref.

Descriptors: *Salmon, *Radioecology, *Calcium, *Cytological studies, *Embryonic growth stages, Absorption, Measurement, Incubation, Fertilization, Fish management, *Fish eggs.

Coho salmon eggs were fertilized and reared in Ca-45 solutions that contained varying amounts of stable calcium, ranging from 6 to 76 mg/liter. As evidenced in one of two egg lots, the eggs in calcium concentrations above 6 ppm showed a significant improvement in fertility. Eggs reared in 76 ppm calcium hatched a day earlier than those reared in calcium concentrations of 16 and 36 ppm, which in turn hatched a day earlier than the egg lots reared in 6 ppm calcium. The stable calcium accumulated during the rearing period, 80 days, was similar in all lots regardless of the concentration of calcium. The amount of Ca-45 accumulated was inversely proportional to the concentration of stable calcium. A significant amount of Ca-45 entered the egg during the water-hardening process, but only a slight amount was taken up during the 57 days to hatching. In the two-week period after hatching, there was at least a tenfold increase in the uptake of Ca-45, which was associated with ossification. (See also W74-07799) (Houser-ORNL)

A SYSTEMS ANALYSIS METHODOLOGY FOR PREDICTING DOSE TO MAN FROM A RADIOACTIVELY CONTAMINATED TERRESTRIAL ENVIRONMENT,

Oak Ridge National Lab., Tenn. R. S. Booth, S. V. Kaye, and P. S. Rohwer. In: Conf. 710501-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee, p 877-893, (1971) 5 fig, 3 tab, 14 ref.

Descriptors: *Radioactivity, *Path of pollutants, *Radioisotopes, *Systems analysis, Computers, Food chains, Human population, Public health, Forecasting, Environment, Habitats, Fallout, Ecology, Air pollution, Water pollution, Soil contamination, Transfer.

A systems analysis methodology has been developed to predict intakes by man, estimate

dose commitments, and identify 'critical' exposure pathways resulting from radioactivity releases to a terrestrial environment. A mathematical model was constructed simulating selected terrestrial pathways by which fallout radioactivity can be transferred ultimately to man. This model is for preliminary predictions radionuclide intakes by man through consumption of milk, beef, and plant parts contaminated directly by fallout as well as by uptake from the soil. Differential equations were written describing the radionuclide transfers, and the parameters required to impement these equations were derived. In verification tests, model predictions of Cs-137 concentrations in environmental compartments agreed within a factor of 2 with experimental data. More extensive verification studies in-volving other radionuclides are needed. The intake rates and total intakes of seven sample radionuclides were predicted for a 'reference' man based on a hypothetical fallout of pCi/cm-2 of each radionuclide. These predicted intakes were used as input to an internal dosimetry model which calculated dose commitments for radionuclide and pathway. The results of these calculations are discussed in relation to individual radionuclide contributions to dose commitment. This generalized food-chain model is sufficiently versatile that it can be applied to many terrestrial environments and to all radionuclides. This first version of the model is expected to undergo future refinements. (See also W74-07799) (Houser-W74-07809

MODELING RADIONUCLIDES AND PESTI-CIDES IN FOOD CHAINS, Battelle-Pacific Northwest Labs., Richland,

Wash. Ecosystems Dept. For primary bibliographic entry see Field 5B. W74-07810

ERROR ANALYSIS OF ECOLOGICAL MODELS,
Oak Ridge National Lab., Tenn.

Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 5B. W74-07811

MATHEMATICAL MODEL OF TRITIATED AND STABLE WATER MOVEMENT IN AN OLD-FIELD ECOSYSTEM,

Puerto Rico Univ., Mayaguez. Dept. of Nuclear Engineering. For primary bibliographic entry see Field 5B. W74-07812

MODELS OF MATTER FLOW IN A SOUTHERN MIXED HARDWOOD FOREST IN FLORIDA: PRELIMINARY RESULTS,

Florida Univ., Gainesville. Dept. of Botany. For primary bibliographic entry see Field 5B. W74-07813

TRANSPORT OF RADIONUCLIDES IN SEDI-MENTS.

Department of Energy, Mines and Resources, Burlington (Ontario). Canada Center for Inland Waters.

For primary bibliographic entry see Field 5B. W74-07814

EFFECTS OF IONIZING RADIATION ON PROCESSES INFLUENCING TOLERANCE OF TREE SEEDLINGS, Oak Ridge National Lab., Tenn.

Oak Ridge National Lab., Tenn.
W. F. Harris, and J. P. Witherspoon.
Let Conf. 710501 Proceedings of the Thi

In: Conf-710501-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tenn. p 961-971, (1971) 2 fig, 5 tab, 35 ref. Descriptors: *Radiation, *Radioactivity effects, *Radioecology, Seeds, *Trees, *Germination, Plant morphology, *Dormancy, Viability, Photosynthesis, Foliar, Root development, Carbohydrates, Transpiration, Water demand, Water supply. Identifiers: Yellow poplar, Silver maple.

Effects of acute doses (up to 500 rads) of fast neutrons on dormant seedlings of yellow poplar and silver maple, which were grown postirradia-tion in light environments of 100, 50, and 25% of full sunlight, indicated specific mechanisms which would reduce seedling tolerance to normal en-vironmental stresses, thus increasing apparent radiosensivities of higher plants as predicted from nuclear parameters. Morphological and physiological responses were monitored periodically. Morphological response varied considerably along a gradient of reduced light, except for bud mortality. Physiological responses were dependent on structural modifications. hotosynthetic capacity of irradiated seedlings was modified by (1) reduced rates of photosynthesis per unit area, (2) early senescence of foliage of irradiated seedlings, and (3) annual variation in recovery of leaf area development. As a consequence of reduced photosynthate accumulation, root production was decreased, occurrence of root production was dellayed, and concentration of storage carbohydrates was reduced. Transpiration rates of excised, aberrant yellow poplar foliage were 1.6 times greater than those of normal foliage. Previously observed increases in drought susceptibility of radiation-damaged plants are postulated to result from increased water requirement of tissue and decreased capacity to supply water because of altered leaf histology and resultant imbalance of leaf area-root biomass ratios following radiation damage to developing buds and leaves. (See also W74-07799) (Houser-ORNL) W74-07815

RADIATION EFFECTS ON SERUM PROTEINS, HEMATOCRITS, ELECTROPHORETIC PAT-TERNS AND PROTEIN COMPONENTS IN THE BLUEGILL (LEPOMIS MACROCHIRUS),

Oak Ridge National Lab., Tenn. G. U. Ulrikson.

In: Conf-710501-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee. p 1100-1105, (1971) 2 fig, 3 tab, 23 ref.

Descriptors: *Radioactivity, *Radioactivity effects, *Fish, Fish toxins, Radioecology, Biology, Biological degradation, *Sunfishes, Research and development.

Identifiers: *Radiation exposure, Dose, Blood.

Gel electrophoresis was used in conjunction with a spectrophotometric protein analysis to study the effects of radiation on the concentration of serum protein fractions in bluegill (Lepomis macrochirus). Four groups of 40 bluegills each were acclimated in aquaria at 20C for 30 days. Three groups were then exposed to 1000, 2000, and 3000 R, respectively, at 167 R/min. Blood samples were taken from each test group at intervals of 2 hr, 24 hr, and then every 48 hr thereafter. A severe decrease (approx. 50%) occurred in the beta globulins, alpha globulins, and albumins within 2 to 24 hr after exposure. After the initial decrease, hemoconcentration occurred. (See also W74-07789) (Houser-ORNL)

SENSITIVITY OF CARP (CYPRINUS CARPIO)
EMBRYOS TO ACUTE GAMMA RADIATION,
Oak Ridge National Lab. Tenn.

Oak Ridge National Lab., Tenn. M. L. Frank.

In: Conf-710501-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee. p 1106-1112, (1971) 3 fig, 10 ref.

Effects Of Pollution—Group 5C

Descriptors: *Carp, *Fish eggs, Hatching, Radioactivity, *Radiation, *Gamma rays, *Propagation(Biological), Reproduction, *Radioactivity effects, Larval growth stage. Identifiers: Organogenesis, Radiosensitivity.

Cyprinus carpio Linnaeus eggs were exposed to acute gamma radiation (500 to 16,000 rads) at different stages of development to observe the effects of radiation on development and hatchability. Except for an increase in radiosensitivity during late cleavage, radiosensitivity decreased as development increased; however, the rate of change was not constant throughout development. Stages in order of decreasing radiosensitivity were: zygote, late cleavage, early cleavage, and ty were related to the physiological state of cells at the time of irradiation. During early cleavage when cell division was synchronous, radiosensitivity was probably influenced by the stage of mitosis at the time of irradiation. Hatchability of eggs irradiated after organogenesis was not affected by any of the experimental doses. The typical development of carp eggs from the zygote to larval stage is shown in a series of photomicrographs. (See also W74-07799) (Houser-ORNL) W74-07817

EFFECT OF RADIATION, SALINITY AND TEMPERATURE ON THE IONIC REGULATION OF THE BLUE CRAB, CALLINECTES

National Marine Fisheries Service, Beaufort, N.C. Center for Estuarine and Menhaden Research. W. Engel, E. M. Davis, J. W. Angelovic, and D. F. Smith

In: Conf-710501-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee. p 1113-1118, (1971) 5 fig, 12 ref

Descriptors: *Crabs, *Radiation, *Radioactivity effects, *Salinity, *Water temperature, *Ions, Animal physiology, Environmental effects, Amino acids, Sodium, Potassium, Chlorine, Magnesium. Identifiers: Blue crabs.

The interaction of ionizing radiation with environmental factors affects the survival of aquatic organisms, due to physiological responses which are not clearly understood. Although studies have been made on the effects of interacting environ-mental factors on survival, physiological response studies have been neglected. Experiments were designed to define how radiation-salinity-temperature interactions affect the ionic regulation of a euryhaline, poikilothermic crustacean, the blue crab, Callinectes sapidus. Immature blue crabs were exposed to an acute radiation dose of 10,000 rds at various combinations of three temperatures (12. 20, and 28 C) and two salinities (5 and 35 p.p.t). At predetermined times after irradiation hemolymph samples were collected from the crabs and analyzed for Na(plus), K(plus), Cl(Minus), and Mg(2plus) and total free amino acids. Salinity and mgizpius) and total free amino acids. Salinity and temperature significantly affected the ionic composition and free amino acid level of the hemolymph, with the highest levels found at the highest salinity. Temperature, however, affected the magnitude of the response and was virtually independent of salinity. Radiation interacted with these two variables to cause alteration in ionic regulation with time after irradiation. Thus the degree of radiation damage to ionic regulation in the blue crab was influenced by the crabs' environment before and after irradiation. (See also W74-07799) (Houser-ORNL) W74-07818

THERMOLUMINESCENT DOSIMETRY OF AQUATIR ORGANISMS, Battelle-Pacific Northwest Lab., Richland, Wash.,

Ecosystems Dept. D. G. Watson, and W. L. Templeton.

In: Conf-710501-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee. p 1125-1130, (1971) 1 fig, 2

Descriptors: *Aquatic life, Aquatic environment, *Columbia River, Fish, Benthos, Water pollution sources, Nuclear powerplants, Effluents, Plutoni-Assay, Assessment, Aqueous solutions, Measurement. Suspended solids, *Radioisotopes.
Identifiers: *Radiophosphorus, Body burden,
*Thermoluminescent dosimetry.

Lithium fluoride thermoluminescent dosimeters were employed to estimate the radiation exposure to Columbia River organisms downstream from the effluent outfalls of the Hanford plutonoumproducing reactors. Highest dose measurements were made in the river benthos. Observed dose was inversely related to distance downstream from the effluent outfalls. Radionuclides in suspension or solution in the river water contributed significantly to the total radiation expo-sure to both fish and benthic organisms. The dose to fish homogenate and intact fish kept frozen during dosimeter exposure was generally inversely re-lated to fish size. This relationship did not hold for the major gamma-emitting nuclides contained in the fish carcass, but appeared to be associated with the body burden of radiophosphorus. (See also W74-07799) (Houser-ORNL) W74-07819

CHROMOSOME ABERRATIONS IN CHIRONOMUS RIPARIUS DEVELOPING IN DIFFERENT CONCENTRATIONS
TRITIATED WATER,

Oak Ridge, National Lab., Tenn. B. G. Blavlock.

In: Conf-710501-Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee. p 1169-1173, (1971) 2 fig, 1

Environment, Bloodworms. Descriptors: *Tritium, Water pollution sources, Nuclear explo-sions, Nuclear powerplants, Effluents, Radiation, Radioactivity effects, Biological degradation, Larval growth stage, Chromosomes, Aquatic animals,

Identifiers: *Tritiated water, *Chromosomal aberrations, *Chironomus riparius.

Since most tritium released to the environment eventually becomes tritiated water, there is a need for data on the biological effects of tritium acquired by organisms from environmental tritiated water. The salivary gland chromosome of Chironomus riparius which had developed in different concentrations of tritiated water were experient for phenomena phenomena. amined for chromosome aberrations. The concentration of tritium ranged from 0.01 to 500 micro-Ci/ml. The concentrations of tritium in the larvae were determined and dose calculations were made for each concentration. Chromosome aberrations were observed in larvae which had developed in concentrations of 125, 250, and 500 micro Ci/ml of tritiated water; however, no aberrations were de-tected at concentrations of 0.1 micro-ci/ml or lower. A response curve developed to relate the frequency of chromosome aberrations to the concentration of tritiated water in which they developed was similar to a two-hit dose response for chromosome aberration produced by x or gamma radiation. (See also W74-07799) (Houser-ORNL) W74-07820

EFFECTS OF CHROME RADIATION EXPO-SURE ON MOSQUITOES (DIPTERA: CU-LICIDAE). 1. EFFECTS OF REARING IN SR-90

+ Y-90 SOLUTIONS, Atomic Energy of Canada Ltd., Pinawa (Manitoba). Whiteshell Nuclear Research Establishment. J. E. Guthrie, and R. A. Brust.

In: CONF-710501 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee, p 1174-1178, (1971) 3

Descriptors: *Radioactivity, *Water pollution effects, *Radioactivity effects, *Mosquitoes, Larvae, Aquatic insects, Public health, Breeding, Reproduction, Biology, Insect eggs, Growth stages, Strontium, Yttrium, Insect control, *Diptera. Identifiers: *Culicidae.

Larvae of Aedes aegypti and A. atropalpus were reared in various concentrations of Sr-90 + Y-90 ranging from 0.1 to 20 microcuries/ml. All these concentrations produced some effects. In many individuals the testes and ovaries of the adults were atrophied. In others, the production of viable sperm and their transfer to the spermathecae were affected, and the oocytes did not mature. Females that received viable sperm laid non-viable eggs. Ir radiated females retained their mating competitiveness did not take any blood-meals. Thus, their release with sterile males might increase the effectiveness of the sterile-male technique for mosquito control. (See also W74-07799) (Houser-ORNL) W74-07821

EFFECTS OF GAMMA IRRADIATION ON THE REPRODUCTIVE PERFORMANCE OF ARTER-MIA AS DETERMINED BY INDIVIDUAL PAIR MATINGS.

Division of Biology and Medicine (AEC),

Washington, D.C. R. L. Holton, C. L. Osterberg, and W. O. Forster. In: CONF-710501 - Proceedings of the Third Na-tional Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee. p 1191-1197, (1973), 3 fig, 1 tab, 18 ref.

Descriptors: *Radioactivity, *Radioactivity effects, *Marine animals, *Brine shrimp, *Reproduction, Breeding, Water pollution, Environment, Growth stages, Broods, Food chains Public health Identifiers: Doses.

The brine shrimp, Artemia, was used as an experimental organism to study the effects of Co-60 gamma irradiation on the reproductive per-formance of an animal species. The total reproduc-tive ability of the brine shrimp was fractionated into various components, and the effect of irradia-tion on each of these components was then determined by studies of reproductive behavior in individual pair matings. In this study the com-ponents identified were the number of broods produced per pair, the number of nauplii voided per brood, the survival of nauplii to sexual maturity, the number of mature adults produced per brood, and finally the number of mature adults produced per pair. All component parameters of total reproductive performance were shown to be affected by irradiation within the range of doses used in this experiment. However, the number of broods per pari was shown to be the factor most sensitive to irradiation, with effects noted at doses of 900 rads and above. (See also W74-07799) (Houser-ORNL) W74-07822

EFFECTS OF GAMMA IRRADIATION ON THE MAINTENANCE OF POPULATION SIZE IN THE BRINE SHRIMP, ARTEMIA,

Division of Biology and Medicine (AEC), Washington, D.C. R. L. Holton, C. L. Osterberg, and W. O. Forster. In: CONF-710501 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee. p 1198-1205, (1971), 6 fig, 2 tab, 5 ref.

Descriptors: *Radioactivity, *Cobalt, *Radioactivity effects, *Brine shrimp, Marine animals, Environment, Water pollution, Growth

Group 5C-Effects Of Pollution

stages, Reproduction, Broods, Zinc, Phosphorus, Analytical techniques, Breeding, Mortality, Food chains, Public health, Fish population. Identifiers: Doses

Population cultures of the brine shrimp, Artermia, were irradiated with acute doses of gamma irradiation from a Co-60 source. The subsequent reproductive performance and size of the cultures were studied for a period of 20 weeks. It was demonstrated that the population cultures may be maintained with only a small part of the reproductive potential exhibited in the pair matings. Therefore, the results of pair matings must necessarily be used to assess the amount that the reproductive potential of Artemia is decreased due to various doses of irradiation. Population cultures at all doses were shown to have the same sized populations at the end of 20 weeks. However, the populations irradiated at higher doses had not recovered to their full reproductive potential at the end of this time. (See also W74-07799) (Houser-ORNL) W74-07823

STRUCTURE AND FUNCTION OF HARD-STRUCTURE AND FUNCTION OF HARDY WOOD LITTER AND SOIL SUBSYSTEMS AFTER CHRONIC GAMMA IRRADIATION, I. MESOFAUNA, NITROGEN, AND TOTAL SOIL RESPIRATION,

Georgia Univ., Athens. Dept. of Zoology. D. C. Coleman, and G. T. Cowley. In: CONF-710501 - Proceedings of the Third Na-

tional Symposium on Radioecology, May 10-12, 1971, Oak Ridge, Tennessee. p 1222-1228, (1971), 6

fig. 4 tab. 33 ref

Descriptors: Soil structure, *Radioactivity, *Cesium, *Radioactivity effects, *Hardwood, *Litter, *Soil contamination, Systems analysis, Hydrologic, Systems, Soil water, Soil tempera-ture, Soil moisture, Subsoil, Soil water movement, Respiration, Carbon cycle, Research and develop-ment, Research facilities, *Nitrogen.

Several enclosures of hardwood litter-soil received dosages of gamma radiation ranging from 3600 to 4 kR. Some plots had reduced microflora and -fauna, others were low in fauna only, and the least dosed had not significant changes in numbers. Only the most heavily irradiated enclosure was significantly below the controls in CO2 out-put, indicating that microflora are more important contributors to overall CO2 output than are mesofauna. Temperature was a more important factor than soil moisture in governing soil respiration. A wide spectrum of radiation tolerances in the forest flood community is reported. Bacteria are the most resistant fungi resistant up to about 1 megarad and the small artropods much less resistant. (See also W74-07799) (Houser-ORNL) W74-07824

STRUCTURE AND FUNCTION OF HARD-WOOD LITTER AND SOIL SUBSYSTEMS AFTER CHRONIC GAMMA IRRADIATION, II.

MICROFUNGI, South Carolina Univ., Columbia, Dept. of Biology, G. T. Cowley, J. W. Martin, and D. C. Coleman, In: CONF-710501 - Proceedings of the Third National Symposium on Radioecology, May 10-12, 1236 (1971) 23-12 1971, Oak Ridge, Tennessee. p 1229-1236, (1971), 2 fig. 11 tab. 15 ref.

Descriptors: *Radioactivity, *Cesium, *Radioactivity effects, *Microorganisms, *Fungi, *Rain forests, Savannah River, Soil, Litter, Popu-Descriptors: lation, Plant population, Environmental effects, Reproduction, Mortality, Plant pigments, Specia-

Identifiers: Doses.

The microfungal populations in six experimental and two control plots were studied before and after irradiation for 113 days with a 9200-ci Cs-137 source. Experimental plots received cumulative doses ranging from 5 million to 4 thousand rads.

The number of detectable propagules was reduced sharply in the three plots receiving the highest dosages. Recovery was slow, since reduced populations in the soil were still in evidence 13 months after termination of irradiation. Species composition of soil and litter populations was also seriously altered. Before irradiation, population in all plots were predictably similar. However, immediately after irradiation, an abnormally high percentage of both soil and litter species isolated from the most heavily irradiated sites was darkly pigmented, and populations displayed little similarity to those in control and lightly irradiated sites. Some lightly pigmented or nonpigmented species soon became reestablished. However, similarities between heavily irradiated plots and nonirradiated plots remained low and had not returned to preirradiation levels in the soil by 13 months after irradiation. Apparent recovery of litter populations was more rapid than for soil populations in regard to both number of detectable propagules and species composition. (See also W74-07799) (Houser-ORNL) W74-07825

HYDROLOGIC RESPONSE OF ICE-COVERED

Iowa Univ., Iowa City, Inst. of Hydraulic Research. For primary bibliographic entry see Field 2E. W74-07832

THE FATE AND EFFECTS OF PESTICIDES IN THE AQUATIC ENVIRONMENT FLATHEAD LAKE DRAINAGE AREA OF Montana Univ., Missoula. Dept. of Zoology.

A. R. Gaufin.

Available from the National Technical Information Service as PB-232 252, \$3.25 in paper copy. \$1.45 in microfiche. Completion Report, Montana Water Resources Research Center, Bozeman, Report No 47, January 1974, 45 p. OWRR A-040-MONT(1).

Descriptors: *Pesticide residues, Water quality, Waterfowl. Lakes, *DDT, *Montana, Sampling, Water pollution effects, Birds, Gas chromatography, Pollutant identification.

Identifiers: *Flathead Lake(Mont), *Osprey, Tordon.

A one-year preliminary sampling of pesticide practices on the Flathead Indian Reservation was conducted, with later work concentrating on the effects of DDT on osprey survival and nesting on Flathead Lake, Montana. The first year's sampling program indicated that major surface, underground and culinary waters were contaminated with Tordon and probably other pesticides and/or herbicides. The phenomenon was believed responsible for the catastrophic decline of the populations of many predatory birds, with evidence it might also be responsible for the decline of the Flathead Lake osprey population. The later work provided additional confirmation of the osprey population decline and delineated possible reasons. Reduction in food resources did not, however, appear to be significant, nor was there evidence of the decline in population being a result of human interference. There was considerable evidence that pesticides in the water of Flathead Lake were responsible for the decline in bird population. (Williams-Montana State) W74-07835

DETERMINING A RECREATIONAL LAKE'S TOLERANCE FOR DEVELOPMENT AND USAGE.

New Hampshire Univ., Durham. Water Resources Research Center. For primary bibliographic entry see Field 5A. W74-07836

SURVIVAL OF ENTERIC PATHOGENS AND INDICATOR ORGANISMS IN NATURAL WATERS.

Tennessee Univ., Knoxville. Dept. of Civil Engineering. or primary bibliographic entry see Field 5A. W74-07840

AQUATIC INVERTEBRATE RECOVERY IN

AQUATIC INVERTIBBATIE RECOVERT IN THE CLINCH RIVER FOLLOWING HAZARDOUS SPILLS AND FLOODS, Virginia Polytechnic Inst. and State Univ., Blacksburg. Dept. of Biology; and Virginia Polytechnic Inst. and State Univ., Blacksburg. Center for Environmental Studies

Center for Environmental Studies.
J. S. Crossman, J. Cairns, Jr., and R. L. Kaesler.
Available from the National Technical Information Service as PB-232 269 \$3.75 in paper copy,
\$1.45 in microfiche. Virginia Water Resources
Research Center, Blacksburg, Bulletin 26
December 1973. 66 p, 20 fig, 6 tab, 47 ref. OWRR
A-054-KAN(1). A-054-KAN(1).

Descriptors: *Benthos, Acid streams, *Invertebrates, *Virginia, *Floods, Water pollution effects, Mollusks, Acids, Powerplants. Identifiers: *Benthic recovery, Clinch River(Va), *Hazardous materials, Sulfuric acid.

The aquatic environment of the Clinch River in southwestern Virginia has been acutely stressed by two spills of hazardous materials. In 1967, fluid from a fly-ash retaining pond caused extensive damage to the biota. In 1970, a spill of sulfuric acid had a similar, though more restricted, effect. Both spills came from a power plant at Carbo, Va. In addition to the acute pollutional stress from the two spills, the environment has been stressed chronispills, the environment has been stressed chromically by the day-to-day operations of the power plant. Moreover, periodic flooding has had a deleterious effect on the biota. The benthic macroinvertebrate community was surveyed in 1969, 1970, and 1971 to assess the effects of the two spills and secondarily to determine the effects of flooding. Numbers of organisms, density, diversity, and cluster analysis of presence-absence data were all used. Results showed that except for the molluscs, the benthic macroinvertebrate community had virtually recovered from the 1967 spill by the summer of 1969. In the reach of the stream immediately downstream from the power plant, recovery was not complete, probably due to chronic stress from the power plant. The 1970 survey revealed the impact of the spill of acid and showed that by the end of the summer recovery was nearly complete, again with the exception of the molluscs. Flooding in the spring before the 1971 survey disrupted the fauna and had a homogenizing effect, in that previously sparsely inhabited stations became richer in species, probably due to increased stream drift with high water. W74-07841

A STOCHASTIC MODEL FOR THE JAMES, Virginia Polytechnic Inst. and State Univ., Blacksburg. Water Resources Research Center. For primary bibliographic entry see Field 5B.

REDUCTION OF LEAD ABSORPTION FROM THE INTESTINE IN NEWBORN RATS. Yugoslav Academy of Sciences and Arts, Zagreb. Inst. for Medical Research.

K. Kostial, I. Simonovic, and M. Pisonic. Environmental Research, Vol 4, p 360-363, 1971. 2 tab. 13 ref.

Descriptors: *Lead, *Retention, *Rodents, *Diets, Biochemistry, Pollutants, Animal physiology, Nutrients, Metabolism, Bioassay, Laboratory tests, Data collections, Measurements, Calcium, Phosphates, Organic compounds, Radioisotopes. Radioisotopes. Identifiers: Alginate.

Effects Of Pollution—Group 5C

The effects of calcium, phosphate and alginate additives to milk on lead absorption from the intestines were investigated in 5-7 day-old rats. The animals were artificially fed over a period of 8 hours with cow's milk and with milk with calcium chloride, potassium dehydrogen phosphate and alginate additives to which tracer amounts of lead-203 were added. They were returned to their mothers and after 90 hours were sacrificed. Lead-203 was determined for the whole body before and after removal of the intestinal tract and also for the liver and the kidney. The retention of lead-203 in the body and organs was greatest in the group of animals fed cow's milk with only lead added. Retention was 1.4 times lower in animals fed with calcium and phosphate milk additives and approximately 2.5 times lower in animals with calcium, phosphate, and alginate additives. (Oleszkiewicz-Vanderbilt)

ENDOGENOUS ZINC EXCRETION AND 65ZINC METABOLISM IN HOLSTEIN CALVES FED INTERMEDIATE TO HIGH BUT NONTOXIC ZINC LEVELS IN PRACTICAL DIETS,

Georgia Univ., Athens. Dept. of Dairy Science. W. J. Miller, E. S. Wells, R. P. Gentry, and M. W. Neathery.

Journal of Nutrition, Vol 101, No 12. p 1673-1682, 1971. 2 fig, 5 tab, 18 ref.

Descriptors: *Metabolism, *Zinc, *Distribution, Biochemistry, Physiology, Nutrients, Retention, Measurment, Laboratory tests, Radiochemical analysis, Bioassay, Diets, Cattle.

Zinc and 65Zn metabolism, from a single intravenous dose (given 7 days after diets were initiated) were studied in Holstein bull calves fed a practical diet containing 38 ppm zinc or the same diet with 200 or 600 ppm supplemental zinc (zinc ooxide). The supplemental zinc increased endogenous fecal 65Zn excretion by 30% with 200 ppm added zinc having as much influence as 600 ppm. The supplemental zinc has a very variable effect on 65Zn distribution in different tissues 14 days after dosing. With some tissues including testicle, rumen wall and abomasum (fundic) each increase in dietary zinc reduced 65Zn content. In muscle, dietary zinc level had no effect on 65Zn concentration. Adding 200 ppm zinc to the diet increased 65Zn and stable zinc in pancreas, liver and kidney; however, a further increase to 638 ppm caused very large increases in these tissues indicating a breakdown in homeostatic control for both injected and absorbed zinc. With the 638 ppm diet smaller increases in 65Zn occurred in bona and small intestine. Serum 65Zn increased with the high zinc diet. Except for muscle, where there was no change, specific activity in every tissue studied decreased with each increase in dietary zinc. (Jerome-Vanderebit)

ANTAGONISTIC EFFECT OF ARGININE ON ZINC METABOLISM IN CHICKS,

Ralston-Purina Co., St. Louis, Mo. B. W. Coleman, E. M. Reimann, R. H. Grummer, M. L. Sunde, and W. G. Hoekstra. Journal of Nutrition, Vol 101, No 12, p 1695-1702, 1971. 4 tab, 19 ref.

Descriptors: *Deficient elements, *Zinc, *Poultry, *Animal pathology, Biochemistry, Physiology, Nutrients, Diets, Metabolism, Growth rates, Environmental effects, Birds, Bioassay, Distribution, Laboratory tests. Identifiers: *Arginine.

Experiments using dried egg white, isolated soybean protein or casein as the dietary protein source were conducted to study the effect of various levels of dietary arginine on zinc deficiency in chicks. Addition of high levels of arginine to each of these protein sources, limiting in zinc, greatly increased the incidence and severity of leg abnor-

malities and tended to lower body weights of chicks. Arginine added to low zinc egg white- or sovbean protein-based diets increased feather abnormalities. With a casein-based diet, it was possible to either eliminate or render very severe the leg abnormalities caused by zinc deficiency simply by feeding a low or high amount, respectively, of supplemental arginine. Supplemental zinc completely prevented the adverse effect of excess arginine. leg abnormalities were also alleviated by histidine and histamine. Increasing the dietary level of arginine resulted in marked decreases in tibia and feather zinc concentrations but did not significantly affect liver zinc concentration. It was suggested that arginine is the previously postu-lated 'complicating factor' of zinc-deficient soybean protein diets, since arginine can account for the differences in zinc deficiency signs which occur among chicks fed the different amino acid sources. (Jerome-Vanderbilt) W74-07955

HYDROBIOCHEMICAL EFFECTS OF SPRAYING WASTE-TREATMENT EFFLUENT IN ST. PETERSBURG, FLORIDA,

Geological Survey, Tallahassee, Fla. R. N. Cherry, D. P. Brown, J. K. Stamer, and C. Z. Goetz. Open-file report, 1973. 21 p, 2 fig, 4 tab.

Descriptors: *Waste water disposal, *Water reuse, *Florida, *Sprinkler irrigation, Sprays, Denitrification, Nitrification, Infiltration, Artificial recharge.

Identifiers: *Land disposal(Wastes), St. Petersburg(Fla).

A spray-irrigation system was tested for wastewater reclamation and reuse in St. Petersburg-Florida. Tests were made of the effectiveness of the soil, bacteria, and vegetation in removing nitrogen and phosphorus from the waste water. Water samples from wells and the lake at the test site were collected and analyzed before and after irrigation using sewage effluent. The total N content of the applied effluent decreased by the time water infiltrated to the 5- and 10-foot depths. At depths of 15 feet and greater, total N content was low compared to the applied effluent. Changes in the concentrations of nitrogen species occurred as the applied effluent infiltrated the soil. The dominant form of nitrogen in the applied effluent was NH4-N. At the 5-foot depth, the dominant nitrogen form was NO3-N. The change from NH4-N to NO3-N can be attributed to the action of nitrifying bacteria. Total PO4 content decreased in samples from the 10-foot depth compared to both the effluent and water from the 5-foot depth. The decrease was not a function of dilution by ground-water. (Knapp-USGS) W74-07978

A PRELIMINARY CHECK-LIST OF THE MARINE ALGAE OF THE MOSS LANDING JETTY: AN ANNOTATED FLORISTIC COM-PILATION.

Moss Landing Marine Labs., Calif.

J. B. Jensen, and S. J. Tanner. Available from the National Technical Information Service as COM-73-11646, \$3.50 in paper copy, \$1.45 in microfiche. Technical Publication 73-7, May 1973. 4 plates, 9 ref. SGP2-94.

Descriptors: *Marine algae, *Baseline studies, *Systematics, *Aquatic plants, Distribution, Phaeophyta, Chlorophyta, Rhodophyta, Habitats, Speciation. Identifiers: *Moss Landing(Calif.).

Base line studies of marine algae at the Moss Landing, California jetty provide a list of algal species present, along with notations but do not represent a compilation of ecological data. The purpose was to describe the basic flora upon which ecological analyses can be begun. The notes supplement presently available information and are therefore uniquely applied to plants growing on the jetty. A synopsis is given of the relative abundance and location of all the species detected. Plants conspicuously, or unusually absent from the jetty are listed; these are species commonly found that would generally be expected to occur at such a location. Species expected to be discovered growing on the jetty in the future, and a set of keys to all the specific locations on the jetty have become defined both by their physical description and by their floristics, i.e., the water-sand-jetty community comprised of rocks partially and completely buried by sand, the sand spit locality, and the harbor end of the jetty. (Jones-Wisconsin) W74-07981

PROGRESS IN ECOLOGICAL RESEARCH AT EDGEWOOD ARSENAL, MARYLAND: FISCAL YEARS 1971 AND 1972, Edgewood Arsenal, Aberdeen Proving Ground,

Edgewood Arsenal, Aberdeen Proving Ground, Md. Biomedical Lab. F. P. Ward

Available from the National Technical Information Service as AD-761 028, \$2.75 in paper copy, \$1.45 in microfiche. Special Publication EASP 1100-13, April 1973. 19 p. 18 ref. 1W662710AD6302.

Descriptors: *Chemical warfare, *Ecology, *Maryland, *Testing, Monitoring, Toxicity, Tracers, Environmental effects, Birds, Amphibians, Mammals, Food chains, Fish, Chesapeake Bay, Invertebrates, Zooplankton, Reptiles, Aquatic plants, Physicochemical properties. Identifiers: *Edgewood Arsenal(Md.).

An ecological study of Carroll Island test area was initiated to establish procedures whereby toxic (or nontoxic) effects caused by the testing of chemical agents by the Edgewood Arsenal are continuously monitored and made known. Research was channeled into laboratory tests to determine toxicities of agents and stimulants to plants, algae, and aquatic organisms and into continuous field stu-dies on the area to measure the environmental impact of the total agent testing program. Several comparative surveys in song and game bird populations were conducted; distribution and abundance of reptiles and amphibians, and thirteen mammalian species have been identified. Fish taken from the Gunpowder River and identified comprise 40 species. Invertebrates on and around Carroll Island were studied in detail. Based on the abundance and diversity of zooplankton, the viability of aquatic and surrounding terrestrial vegetation, the unique co-occurrence of two species of diaptomids, and normal seasonal events in life histories of two species of fairy shrimp, the Carroll Island pond showed no evidence of deleterious effects of chemical agents. Physicochemical parameters, toxicities to aquatic plants and to fish were measured and fish kills and other incidents investigated. The studies indicated that no measurable acute ecological damage has resulted from the tests. (Jones-Wisconsin) W74-07986

THE EFFECTS OF CRUDE OIL POLLUTION ON THE BEHAVIOR OF MARINE INVERTEBRATES,

City of Hope National Medical Center, Duarte,

Calif. J. S. Kittredge.

Available from the National Technical Information Service as AD-762 047. Office of Naval Research, Arlington, Va., Final Report June 1973. 12 p. 1 tab, 6 ref. N00014-71-C-0103.

Descriptors: *Oil pollution, *Animal behavior, *Marine animals, Invertebrates, Psychological aspects, Solubility, Crabs, Insect repellents. Identifiers: *Aromatic hydrocarbons, Chemoreception, Feeding inhibition.

Group 5C-Effects Of Pollution

Effect of crude oil pollution on behavior of marine invertebrates was investigated. Since almost all marine invertebrates depend on chemoreception as their prime receptor of environmental information, effects of oil pollution on two aspects of this reception were examined. Although petroleum products are considered to be insoluble in sea vater many fractions do have a limited solubility Methods were devised for examining the effects of this soluble fraction on chemoreception. Utilizing the Lined Shore crab, Pathygrapsus crassipes, two bioassays were devised, one for the 'specialist' receptors and one for the 'generalist' receptors. Initial studies revealed that the water soluble extract of crude oils completely inhibited both the 'specialist' and the 'generalist' chemoreceptors. These observations suggest that the sublethal effects of water soluble components of petroleum products may alter species survival by inhibiting reproduction and growth. Both of these elements, because of the major role of chemoreception in the marine environment, are sensitive to low levels of aromatic hydrocarbon pollution. Supplemental research on natural 'cryptic odors' used to 'blind' the chemoreceptors of predators suggests development of synthetic 'cryptic odors' that could inhibit the settlement of fouling organisms or, in the terrestrial environment, as insect repellents. (Jones-Wisconsin) W74-07987

PHYTOPLANKTON COMMUNITY STRUC-TURE AND NUTRIENT RELATIONSHIPS IN LAKE CARL BLACKWELL, OKLAHOMA, Oklahoma State Univ., Stillwater.
For primary bibliographic entry see Field 2H.

A PREDICTION OF CHANGES IN THE THER-MAL CYCLE OF A STRATIFIED LAKE USED TO COOL A 1000 MW POWER PLANT, Cornell Univ., Ithaca, N.Y. Dept. of Thermal En-

gineering.

F. K. Moore, and J. F. Mackenzie.
Publication No 32, presented at Water Resources and Marine Sciences Conference, January 1971,
Cornell Univ., Ithaca, N.Y. 23 p. 9 fig, 9 ref.

Descriptors: *Mathematical models, *Water temperature, *Stratification, *Cooling water, Mixing, Thermocline, Diffusion, Hypolimnion, Thermal pollution, Lakes, Nuclear powerplants. Identifiers: Cayuga Lake(N.Y.).

A model is computed showing the effects of nuclear powerplant cooling water pumped across the thermocline of a deep, stratified lake. A one-dimensional or lake-averaged representation is adopted on the basis that horizontal diffusion is so rapid that only vertical temperature gradients need be considered. Basically, the lake and therefore the representational model, can be considered to be a one-dimensional thermal oscillator responding to an oscillatory heat input to its surface. The equations for the model are simply the heat balances for the separate layers involved. The simple model is proposed for the estimation of changes in the temperature cycle due to thermal discharge from one or more 1000 MW power plants. The mixing process is modeled by semi-empirical stratification criteria and a single summer diffusion coefficient. The power plant is considered to increase heat input and to enhance the lake's mixing process during the summer by the withdrawal and return of lake water. Calculations are made for various numbers of power plants and heat dilution ratios. Heat and mixing enhancement are shown to have comparable effects on the onset and termination of stratification, summer maximum, and winter minimum temperatures of a typ-ical lake. (Jones-Wisconsin) W74-07998

ENVIRONMENTAL FACTORS OF LEUKEMIA MORBIDITY, (IN POLISH), K. Janicki.

Patol Pol. Vol 23, No 1, p 29-48. 1972. (English summary).

summary). Identifiers: Carcinogenesis, Cattle, Environmental effects, Herbicides, *Human diseases, Insecticides, *Leukemia morbidity, *Poland Cracow region, Pollution, Poultry, Seed dressings, Water supply, *Potable water, *Public health.

A retrospective analysis of leukemia morbidity and 25 environmental factors connected with demographic data, health service, agricultural chemicals, water supply and breeding of some domestic animals in 18 units of the Cracow region from 1961-1968 is reported. A statistical analysis of rectilinear and multiple correlations between leukemia morbidity and intensity of the environmental factors was made. A significant (at the 1% confidence level) positive rectilinear correlation was demonstrated between leukemia morbidity in rural environments and consumption of seed dressings, percentages of the population supplied with water from wells or local waterlines, intensity of cultivation of cattle and poultry and indexes of the size of herds. A significant positive rectilinear correlation was also found between morbidity of acute leukemias in different administration units of the region and indexes of consumption of chemical herbicides and insecticides used for spraying. A negative rectilinear correlation signifi-cant at the 1% confidence level was found between indexes of leukemia morbidity in the rural environment and population density per 1 km squared, numbers of physicians per 100,000 popusquared, numeers of physicians per 100,000 population and percentages of the population supplied with water for drinking and domestic purposes from collective water reservoirs. The first of these correlations was rejected as being due to inhomogeneous population density. The second and third correlations were attributed to a favorable indirect influence of sanitary supervision. direct influence of sanitary supervision, a larger number of physicians and better sanitary state of water supplies compared with water from wells or other open, uncontrolled sources.--Copyright 1973, Biological Abstracts, Inc. W74-07999

DISTRIBUTION OF PHOSPHORUS, SILICA, CHLOROPHYLL A, AND CONDUCTIVITY IN LAKE MICHIGAN AND GREEN BAY, Wisconsin Univ., Milwaukee. Center for Great

Lakes Studies.

D. C. Rousar, and A. M. Beeton.

Transactions of Wisconsin Academy of Science, Arts and Letters, Vol LXI, p 117-140, 1973. 10 fig, 4 tab. 25 ref.

Descriptors: *Phosphorus, *Silica, *Chlorophyll, *Conductivity, *Lake Michigan, Standing crops, Phytoplankton, Wisconsin, Michigan, Illinois, Indiana, Eutrophication, Spatial distribution.
Identifiers: *Green Bay(Wis.), Phaeopigments

Spatial distribution of total phosphorus, silica, chlorophyll-a, and conductivity were determined by sampling 17 stations in central Lake Michigan and 21 stations in southern Green Bay at various depths. Results were compared with previous data to see if nutrient enrichment had occurred. Lake Michigan water averaged 10.4 micrograms phosphorus/1 as total phosphorus, 1.0 mg silphosphorus/1 as total phosphorus/1.10 mg sil-icate/1 as soluble reactive silica, 3.0 micrograms chlorophyll-a/1 as total chlorphyll, and 256.1 micromhos/cm as specific conductance. Green Bay values were 87.8 micrograms phosphorus/1, 0.9 mg silicate/1, 32.9 micrograms chlorophyll-a/1, and 257.7 micromhos/cm as specific conductance. Surface concentrations of phosphorus, chlorophyll, and conductivity varied little in the lake but decreased along a 10 mile transect extending from the mouth of Fox River to a bay station. Silica, uniformly distributed in the bay, showed some inshore-offshore differences in the lake. At most Green Bay stations, vertical differences in parameters tested were minor. In Lake Michigan, conductivity and phosphorus were relatively constant with depth. Silica increased with depth except at one station; chlorophyll was highest at the 30 m depth of 13 of 17 stations. (Jones-Wisconsin) W74-08000

ECOLOGY OF THE EULITTORAL ZONE OF LAKES, Warsaw Univ. (Poland), Lab. of Hydrobiology.

E. Pieczynska. Ekologia Polska, Vol 20, No 44, p 637-732. 29 fig, 10 tab, 136 ref.

Descriptors: *Littoral, *Ecology, *Lakes, *Shores, *Shallow water, Organic matter, Degradation(Decomposition), Hydrology, Physiocochemical properties, Primary productivity, Light intensity, Thermal properties, Hydrography, Sediments, Biological communities, Oxygen, Nutrients.

Identifiers: *Eulittoral zone, Masurian Lakeland(Poland).

conditions Environmental and biological processes in the eulittoral--the intermediate zone between lake and surrounding land--of 16 Masuri-an lakes (eutrophic, mesotrophic, and dystrophic) in Poland were analyzed. Characteristics of the hydrological and physicochemical conditions, regularity of occurrence of plant and animal communities, production and decomposition processes, and the role of the culittoral zone in the functioning of lake ecosystems were studied. Three sources of organic matter were distinguished: matter produced in the culittoral by the producer community living in this habitat, accumulated matter of lake origin (produced elsewhere in the lake and accumulated in the eulittoral due to wave action), and accumulated matter of terrestrial origin. The culittoral is characterized by specific biological processes and its role in the lake biological processes and its role in the lake ecosystem differs from other zones. It is an ex-tremely differentiated habitat, a typical ecotone, in which terrestrial and aquatic organisms are found and also specific organisms. An observed phenomenon is described as the 'edge effect;' it is characterized by periodically great primary production rates and is an accumulating 'store' of various kinds of matter of terrestrial and aquatic origin. Environmental conditions and biological processes are, to a considerable extent, affected by water level fluctuations. (Jones-Wisconsin) W74-08003

PLANKTON PRODUCTION AND WATER QUALITY IN SPANISH RESERVOIRS, FIRST REPORT ON A RESEARCH PROJECT, Centro de Estudios Hidrograficos, Madrid (Spain).

R. Margalef, D. Planas, J. Armengol, J. Toja, and A. Guiset

Prepared for 21st Congress of International Commission on Large Dams, June 11-15, 1973, Madrid, Spain. 46 p, 19 fig, 4 tab.

Descriptors: *Plankton, *Productivity, *Water quality, "Reservoirs, Nitrogen, Phosphorus, Silica, Diatoms, Bacteria, Eutrophication, Management, Limnology, Phytoplankton, Zooplankton, Alkalinity, Indicators, Crustaceans, Trophic level, Distribution, Rotifers. Identifiers: *Spain, Arcodiaptomus ibericus

A survey was started of water characteristics of Spanish reservoirs and the ecological effects on plankton production and composition. The aim was to define the impact of the whole ecosystem on the quality of stored water and describe basic characteristics of the dammed rivers or artificial lakes. Broadly, Spain consists of tertiary basins, limited by sierras of mesozoic limestones; large areas in the west and especially northwest, as well as some outcrops in the axis of the main mountain ranges are of siliceous materials, paleozoic or in-trusive. Nitrogen and phosphorus are usually considered limiting fectors for primary production; silica may be limiting for diatom growth. Some preliminary bacterial counts are summarized. More than 50% of the studied reservoirs can be considered as eutrophic with a larger proportion of the smaller reservoirs in such a

Effects Of Pollution-Group 5C

Euthrophy parallels the age of artificial lakes. When several reservoirs are linked in a chain, careful management can lead to an improvement of the water quality. Arcodiaptomus ibericus (Crustacea Copepoda) hitherto undescribed is now common in reservoirs although not found in natural environments; it is described and illustrated. (Jones-Wisconsin) W74-08005

OXYGEN DEPLETION MODEL FOR CAYUGA

LAKE, California Univ., Berkeley. Dept. of Civil and En-

vironmental Engineering.
J. D. Newbold, and J. A. Liggett.
Journal of the Environmental Engineering Division American Society of Civil Engineers, Vol 100, No EE1, p 41-59, February 1974. 9 fig, 4 tab, 35 ref. NSF Grant GK-23992.

Descriptors: *Oxygen sag, *Mathematical models, Dissolved oxygen, Hypolimnion, Stratification, Eutrophication, Anaerobic conditions, Productivity, Organic matter, Water temperature, Lake morphology, Respiration, Diffusion, New York. Identifiers: Cayuga Lake(N.Y.).

Depletion of dissolved oxygen from hypolimnia of stratified lakes is both an integral and serious aspect of eutrophication. While it has been established that the degree of deoxygenation is related to productivity, questions remain regarding the specific processes by which the depletion oc-curs and the quantitative relationships among the thermal structure of a lake, its biological activity, and the resultant oxygen regime. These parameters are related through the use of a mathematical model of Cayuga Lake, New York from which a clearer explanation of the physical and biological processes of oxygen depletion are derived. limitations of a one-dimensional model are evident and the inclusion of horizontal transport would conform better to reality. However, knowledge of the biological process is the real limiting factor. The model, and others of similar nature, can indicate what the critical parameters might be. In the lowest parts of the lake the benthic demand, still largely unknown, appears to dominate; in the upper parts benthic demand (depending on lake configuration), respiration, and decay all play important parts and interact with diffusion. Obvi ously an accurate determination of benthic demand would contribute greatly to the construction of a reliable model. (Jones-Wisconsin) W74-08007

SOURCES, SINKS, AND METHODS OF ANAL-YSIS OF ORGANIC NITROGEN COMPOUNDS IN FRESH WATER SYSTEMS,

J. A. Kelly.

Available from the National Technical Informa-tion Service as ORO-4254-10 \$3.75 in paper copy, \$1.45 in microfiche. Atomic Energy Commission Report (undated). 28 p, 4 fig, 2 tab, 46 ref.

Descriptors: *Sinks, *Analytical techniques, *Nitrogen compounds, *Organic compounds, Freshwater, Water pollution sources, Industrial wastes, Municipal wastes, Runoff, Metabolism, Agriculture, Nitrogen fixation, Nitrification, Nitrates, Ammonia, Euthrophication, Distillation, Colorimetry, Freezing, Longer, Spaces Colorimetry, Freezing, Ion exchange, Spectrophotometry, Chromatography, Oklahoma, Odor, Measurement.

Identifiers: Deamination, Lysis, Kjeldahl method, Ultraviolet combustion, Titrimetry, Liquid-liquid extraction, Lake Carl Blackwell (Okla.)

'Basic' trace organics in natural systems are reviewed in order to delineate the significance of their sources, sinks and analytical methods. A major objective of the study is the eutrophication process in Lake Carl Blackwell, Oklahoma, organic nitrogen sources, and its dynamics. Sources include industrial and domestic wastes, natural runoff, and metabolic products of aquatic life and

microbial action. A great proportion of organic nitrogen compounds are caught up in a cycle of biological assimilation, decomposition, and inorganic processes in the economy of the ecosystem. ganic processes in the economy of the ecosystem. Depending upon the efficiency of the community, certain quantities of these and other compounds will be lost. Methods of analysis used for total organic nitrogen are Kjeldahl, ultraviolet combustion, distillation and titrimetry, and colorimetry. In identifying organic nitrogen compounds, concentration is determined by carbon adsorption, liquid-liquid extraction, freezing-out, distillation, and ion exchange. Determination methods are spectrophotometric analysis (visual range, ultraviolet range, infrared) and gas-liquid, paper and thin-layer, and liquid-liquid chromotopaper and thin-layer, and liquid-liquid chromoto-graphic analysis. Basic ecological principles and concepts are illustrated. Some colorimetric methods for the determination of non-aromatic organic nitrogen compounds are tabulated. Characteristics of organic pollution and odors are classified by chemical types. (Jones-Wisconsin) W74-08008

THE PHOTOSENSITIZING ACTION OF CAR-CINOGENS. I. THE ACTION OF 2-NAPHTHYLAMINE ON ESCHERICHIA COLI K-12 AND PARAMECIUM CAUDATUM,

A-12 AND FARMELIUM, Auburn Univ., Ala. Dept. of Chemistry. S. P. Ellis, R. C. Smith, and W. C. Neely. Candian Journal of Microbiology, Vol 20, No 2, p 125-129, 1974, 2 fig. 25 ref. OWRR A-017-ALA(4).

Descriptors: *Photoactivation, *Ciliates, Organic compounds, *E. coli, Photysynthesis, Light. Identifiers: *Photosensitizing, 2-Naphthylamine, *Paramecium caudatum, *Carcinogens.

Cultures of Paramecium caudatum incubated with .0000007 M 2-naphthylamine were rapidly killed when exposed to light of 366 nm. Cultures not exposed to the amine were unaffected by the light; cultures kept in the dark were unaffected by the amine. Escherichia coli K-12 populations were markedly reduced after irradiation of suspensions in water containing .0003 M 2-naphythylamine with light simulating natural sunlight in intensity and wavelength distribution. Suspensions of E coli in deionized water were unaffected by the light and E. coli suspended in solutions of the amine but kept in the dark were also unaffected. Since 2-naphthylamine is a known water pollutant these results may be of ecological importance.

A SCANNING ELECTRON MICROSCOPIC STUDY OF SECONDARY LAMELLAE AND CHLORIDE CELLS OF RAINBOW TROUT (SALMO GAIRDNERI), Michigan State Univ., East Lansing. Dept. of Physiology.

Physiology.
K. R. Olson, and P. O. Fromm.
Z. Zellforsch, Vol 143 p 439-449, 1973. 12 fig, 18 ref. OWRR A-064-MICH(2). 14-31-0001-3822.

Descriptors: Chlorides, *Rainbow trout, Analytical techniques, "Electron microscopy,
Identifiers: Scanning electron microscope,
"Chloride cells, Gills, "Lamellae, Ultrastructure.

Scanning electron micrographs of gill tissue from trout fixed with 50% glutaraldehyde revealed the presence of microridges on surfaces of epithelial cells of the secondary lamellae. These microridges vary in length from 1 to 7 microns, with a mean height of 0.75 microns. Calculations show that they increase the total lamellar epithelial surface area approximately 2.5 fold. Mucus secreting cells are present on the body of the filament and on secondary lamellae. Chloride cells are located primarily in the interlamellae filamental epithelium and on the basal area of lamellae. Ex-tensions of the chloride cell epithelium are microvillous in nature and their height is only slightly greater than that of the microridges of typ-ical lamellar epithelial cells. A reduction in number of complete absence of microvilli on chloride cells appeared to be related to degenerative changes in these cells observed in transmission electron micrographs. Non secretory interlamellae filamental epithelial cells have microridges of very attenuated lengths. W74-08096

TOXICITY OF AN ALGAL COMPLEX ON FRESHWATER FAUNA: 1. ACTION ON SOME BENTHIC ANIMALS AND FISHES. (IN FRENCH).

Lyon-1 Univ., Villeurbanne (France). Laboratoire

de Biologie Animaux et d'Ecologie. S. Michel, J. Gevrey, and J. Wautier. Bull Soc Sci Vet Med Comp Lyon. Vol 74, No 2, p

185-189, 1972. Illus. English summary.
Identifiers: *Algal, Anodonta, Benthic,
Chironomid, *Fauna(Freshwater), Fishes,
France(Lac du Bounget), Microcystis, Pseudanaboena, *Toxicity, Aquatic animals.

The algal complex studied was Microcystis Far-lowiana with Pseudanaboena Franqueti, Cyanophyceae that occur in the Lac du Bourget (Savoie) in France and that inhibit benthic fauna in their environment. Experiments showed that 1 or several toxic factors liberated after death of the algal cells can kill fish, chironomid larvae and mollusks (Anodonta spp.). Chemical composition of the toxic factor is being studied.--Copyright 1973, Biological Abstracts, Inc. (See also W74-08109) W74-08108

TOXICITY OF AN ALGAL COMPLEX ON

FRESHWATER FAUNA: 2. ACTION ON LYM-NAEA SPP. (IN FRENCH). Ecole Nationale Veterinaire de Lyon (France). Laboratoire de Recherches de la Chaire of Parasitologie.

Bull Soc Sci Vet Med Comp Lyon. Vol 74, No 2, p 191-194, 1972. English summary.

Identifiers: *Algal, *Fauna(Freshwater), Lymnaea-auricularia, *Lymnaea-spp, Lymnaea-truncatula, Microcystis, Pseudanaboena, *Toxicity, Water pollution effects.

The algal Cyanophyceae complex Microcystis Farlowiana + Pseudanaboena Franquetii was tested in laboratory against L. auricularia and L. truncatula. Algae were used after being heated, frozen and thawed, dessicated, pulverized or disintegrated by an ultrasonic apparatus. Only lysed cells are toxic; and within 48 h, they kill the snails after paralyzing them. The toxic factor is ther-moresistant (100C) and water soluble.—Copyright 1973, Biological Abstracts, Inc. (See also W74-08108) W74-08109

SPECIES COMPOSITION OF EPIPHYTIC BACTERIA OF GREEN FILAMENTOUS ALGAE IN THE NORTHERN DONETS-DONBAS CANAL,

(IN RUSSIAN), Akademiya Nauk URSR, Kiev. Instytut

G. N. Oleinik

Gidrobiol Zh. Vol 8, No 5, p 97-99, 1972.

Identifiers: *Algae, *Bacteria(Epiphytic), Canals, Cladophora-fracta, Enteromorpha-intestinalis, Enteromorpha-intestinalis, Species, Filamentous, Spirogyra-sp, *USSR(Donets-Donbas canal), Chlorophyta

An investigation of N. Donets-Donbas canal showed that the species composition of heterotrophic bacteria inhabiting the surface of green filamentous algae (Cladophora fracta, Enteromorpha intestinalis, and Spirogyra sp.) is rich.--Copyright 1973, Biological Abstracts, Inc. W74-08112

LIMNOLOGICAL OBSERVATIONS ON THE 'NATIONAL WATERSPORTBAAN GEORGES

Group 5C-Effects Of Pollution

NACHEZ' AT GHENT IN 1968, 1969, 1970 AND

Rijksfaculteit der Landbouwwetenschappen, Ghent (Relgium).

De Maeseneer

Meded Fac Landbouwwet Rijksuniv Gent. Vol 37 No 1, p 289-313, 1972. Illus.

Identifiers: *Belgium(Ghent), Biological studies, Chemical studies, Fish, *Limnological studies, *Mortality(Fish), Physical studies, Water pollution effects.

Various physical, chemical and biological aspects of the 'Nationale Watersportbaan Georges of the 'Nationale Watersportbaan Georges Nachez' at Ghent (Belgium) were studied. This stagnant water has beta-mesosaprobic characteristics. The chemistry and biology of the water was influenced by the extensive fish-mortality that occurred on Dec. 17, 1969.--Copyright 1973, Biological Abstracts, Inc. W74-08113

INVESTIGATIONS ON THE OCCURRENCE OF PHENOL-DECOMPOSING MICROORGANISMS IN WATERS AND SEDIMENTS. (IN GERMAN), Kiel Univ. (West Germany). Institut fuer Meereskunde.

R. Iturriaga, and G. Rheinheimer. Kiel Meeresforsch. Vol 28, No 2, p 213-218, 1972.

Illus. English summary.

Identifiers: Baltic Sea, *Decomposing organic matter, *Micro organisms, *Phenols, Polluted matter, aters, Rivers, Season, Sediments, Temperature, *West Germany.

In the Baltic and the North Sea, as well as in the small Schwentine river, experiments were made on the presence of microorganisms which decompose phenol. For this purpose, a method of determining the phenol-degradation capacity of water and sediment samples was worked out. Phenol-oxidizing microorganisms were present in polluted waters in the summer as well as in the winter. Microbial decomposition of phenol takes place mainly during the warm season at water temperatures above 10C. At the outer end of the Kiel-fjord (West Germany) the capacity to degrade phenol increased in the spring and summer with the temperature of the water. In the open Baltic and North Sea, phenol-decomposers were found only in some sediment samples, not, however, in the water.--Copyright 1973, Biological Abstracts, Inc. W74-08115

RELICS OF THE BOGGY VEGETATION IN SODIC TERRITORIES, (IN HUNGARIAN), Lajos Kossuth Univ., Debrecen (Hungary). Dept. of Botany.

For primary bibliographic entry see Field 2H.

W74-08122

EFFECT OF ORGANIC AND INORGANIC FER-TILIZERS ON THE GROWTH AND DEVELOP-MENT OF JUVENILE CARP IN SPAWNING PONDS, (IN RUSSIAN).

A. Vlasov.

Dokl Mosk S-Kh Akad Im K A Timiryazeva. 181,

p 220-223. 1972. *Carp(Juveniles), *Fertilizers. *Growth, Inorganic fertilizers, Organic fertilizers, Ponds(Spawning).

Faster growth of juvenile carp was noted in fertilized ponds. The weight of food in the intestine as percent of body weight was 1650% as opposed to 985% in the unfertilized ponds.--Copyright 1973, Biological Abstracts, Inc.

PRIMARY PRODUCTION AND RESPIRATION OF THE PHYTOPLANKTON OF THE RIVERS THAMES AND KENNET AT READING,

Warsaw Univ. (Poland). Dept. of Hydrobiology. A. Kowalczewski, and T. J. Lack.

Freshwater Biol. Vol 1, No 2, p 197-212. 1972.

Identifiers: Chlorophyll, Light, Pheo pigments, *Phytoplankton, *Primary production, *Respiration, Rivers, Seasonality, Solar radiation, Dark bottle technique, *United Kingdom(Thames-Kennet Rivers).

During the period April 1967-April 1968 the phytoplankton production and respiration of the River Thames and its tributary, the River Kennet(England), were measured at approximately 2wk intervals using the light and dark bottle technique. Concentrations of chlorophyll and pheopigment were determined weekly. On 14 occasions, sets of light and dark bottles were rotated in a specially designed apparatus, and production and respiration values obtained were 1.38 plus or minus 0.31 times higher than in stationary bottles at identical depths over the same period. There are at identical depths over the same period. Increare little horizontal, vertical or diurnal variation in chlorophyll concentration. Peaks of chlorophyll were found in spring, summer and autumn in the Thames (max. 219 mg/m3) but there was very little variation in the Kennet (max. 38.2 mg/m3). Pheopigment concentration was low in both rivers for most of the period, although the Kennet this represented on average 50% of the pigments present. In the Thames, a peak of pheopigments (133.5 mg/m3) was associated with the autumnal bloom and represented 61% of the total pigments. No pheopigments were detected during the spring bloom. The average concentration of suspended organic matter was identical in both rivers but in the Thames over 25% was due to phytoplankton and in the Kennet almost 95% was non-algal. In the Thames, net oxygen production reached a peak in May and was negative from Nov. to Feb. In the Kennet, maximum production also occurred in May but was negative from the middle of May until the following March. The average annual net production was 1250 and -78 g O2/m2 in the Thames and Kennet respectively. Respiration rates showed similar fluctuations, 4.59 g O2/m2/day in spring in the Thames to 0.09 g O2/m2/day in Nov. The Kennet was almost always lower (1.05-0.34 g O2/m2/day). The average annual respiration was almost 3 times higher in the Thames than in the Kennet (641-228 g O2/m2). Various factors which might influence production are discussed.--Copyright 1973, Biological Ab-W74-08132

INVESTIGATIONS ON THE OCCURRENCE AND DECOMPOSITION OF FATS AND FATTY ACIDS IN LAKES, (IN GERMAN), Biochemisches Institut Umweltcarciogene,

Ahrensburg (West Germany). J. Poltz.

Arch Hydrobiol Supplement B. Vol 40, No 4, p

315-399. 1972, Illus. (English summary). Identifiers: *Bacteria, *Decomposition(Organic matter), *Fats, *Fatty acids, Lakes, Phytoplank-ton, Zooplankton, Lake sediments.

The main proportion of particulate organic matter, lipids, fatty acids, and triglycerides in lakes derives from the phyto and zooplankton. A part of those substances in the seston, and especially in the sediments, originates in bacteria. The most rapid decomposition takes place in the epilimnion, in the hypolimnion and in the sediments it is much slower. The main decomposition and alterations in the sediments are found in the surface layer of the sediments according to the distribution of bacteria.--Copyright 1973, Biological Abstracts, Inc.

SEASONAL CHANGES OF BENTHOS ALGAE OF THE HIGHER PART OF VORSKLA RIVER, (IN RUSSIAN),

Leningrad State Univ. (USSR). A. S. Shaaban.

Vestn Leningr Univ Ser Biol. Vol 27, No 3, p 63-67, 1972, Illus. (English summary).

Identifiers: *Algae, Bacillariophyta, *Benthos, Chlorophyta, Cyanophyta, Euglenophyta, Rivers, Saprobity, *Seasonal, *USSR(Vorskia River), Water pollution effects.

Benthos algae of Vorskla river, USSR, were studied in the Belgorod region at 3 points in the course of 6 mo. from April to Sept. 1969 and 1970. From 6 divisions of algae, 267 taxa were identified. Benthos algae of the river have a diatom character during the periods of collection. The quantity of Chlorophyta, Euglenophyta, Cyanophyta and Bacillariophyta increases with the increase of water temperature. Each of dominants taxa of different divisions of algae has maximum growth at the different seasonal periods of the year. It can be shown also that phytobenthos at sampling points 1 and 2 by systematical composition and dominants taxa are similar, but at point 3 systematical composition was less varied and the number of separate species especially by Cyanophyta and Euglenophyta rather lower. This difference is probably due to the fact that at point 3 the river is deeper and the saprobity of the water is lower.--Copyright 1973, Biological Abstracts, Inc. W74-08142

DETERMINATION OF COUNTING EFFICIEN-CY BY 14C BY LIQUID SCINTILLATION IN PRIMARY PRODUCTION MEASUREMENTS IN A LAGOON ENVIRONMENT, (IN FRENCH),

Tunis Univ. (Tunisia). Laboratoire d'Oceanographie.

For primary bibliographic entry see Field 5A. W74-08143

ENVIRONMENTAL STRESS IN THE PASTURE SERICESTHIS SCARAB BOISD.: MORTALITY IN LARVAE CAUSED BY

HIGH TEMPERATURE, Commonwealth Scientific and Industrial Research Organization, Armidale (Australia). Pastoral Research Lah

R. L. Davidson, J. R. Wiseman, and V. J. Wolfe. R. L. Davidson, J. R. Vischilar, and S. J. Jappl Ecol. Vol 9, No 3, p 783-797. 1972, Illus. Identifiers: Environmental stress, *Larvae mortality. *Scarab(Pasture), *Sericesthistality, *Scarab(Pasture), *Sericesthis-Nigrolineata, *Thermal stress, *Thermal pollution.

First- and 2nd-instar larvae of S. nigrolineata (Scarabaeidae; Coleoptera) were exposed for short periods to temperatures between 30-45C, to define empirically the effects of duraction, number of exposures and recovery periods on mortality. The data are needed to collate field microclimate measurements to predict larval survival in the field. At moderate soil moistures the longest exposure to 30C (192 hr) was harmless, and the shortest exposure to 40C (45 min) was lethal. Above 30C, the effect of temperature for any one duration of exposure was exponential. At any one temperature the relationship between duration of exposure and mortality appeared to be linear, but the gradients between the 2.5C temperature intervals were too steep to be clearly defined. Repeated exposures to sublethal temperatures caused a slightly lower percentage mortality than at the previous exposure to the same tem-perature. When the interval between repeated exposures was extended from 1 day to 2 or 4 days, the mortality was slightly less than that after the same number of exposures on consectuvie days, but the difference was not statistically significant over all temperatures. All these exposures to temperature stress were in soil with moisture contents above wilting point. No temperature X moisture interaction occurred. (See also W74-08147)--Copyright 1973, Biological Abstracts, Inc. W74-08146

ENVIRONMENTAL STRESS IN THE PASTURE SCARAB SERICESTHIS NIGROLINEATA BOISD.: II. EFFECTS OF SOIL MOISTURE AND TEMPERATURE ON SURVIVAL OF FIRSTINSTAR LARVAE,

Commonwealth Scientific and Industrial Research Organization, Armidale (Australia). Pastoral

R I Davidson I R Wiseman and V I Wolfe. J Appl Ecol. Vol 9, No 3, p 799-806. 1972, Illus.

Identifiers: Environmental stress, Instar larvae,
Molting. *Scarab(Pasture). *Sericesthis-Nigrolineata, Survival, *Soil moisture, *Soil tem-

First-instar larvae of S. nigrolineata were exposed, for various periods of up to 8 days, to a range of soil moistures equivalent to pF 1-5.8 at temperatures from 16-45C. Maximum survival occurred at pF 2.7-4.2, equivalent to soil moistures of 5-10% in silt and 6-12% in loam. In drier soil, water loss was rapid, and most larvae died in one day. Increasing temperature in the range 16-30C caused a greater mortality in dry soil. In soils moister than pF of 2.7 there was a significant increase in mortality after 2 and 4 days exposure, but the causes of death could not be identified. After all treatments the larvae were maintained under optimum conditions until after ecdysis. No residual effect of temperature or moisture stress was apparent from a comparison of survival data before and after molting. (See also W74-08146)--Copyright 1973, Biological Abstracts. Inc. W74-08147

5D. Waste Treatment Processes

IRRIGATION OF CITRUS WITH CITRUS

WASTE WATER, Florida Univ., Lake Alfred. Inst. of Food and Agricultural Sciences. R.C. J. Koo.

Available from the National Technical Informa-tion Service as PB-232 046, \$4.00 in paper copy, \$1.45 in microfiche. Florida Water Resources Research Center, Gainesville, Publication No 28, March 1974. 73 p, 7 fig, 17 tab, 28 ref, 4 append. OWRR A-016-FLA(1). 14-31-0001-3209, 14-31-0001-3509, and 14-31-0001-3809.

Descriptors: *Irrigation, *Waste water disposal, Plant growth, Soil moisture, Leachate, *Citrus, Return flow, *Florida, *Water reuse, Soil profiles, Path of pollutants, Waste water treatmen

Several citrus scion-rootstock combinations were grown in greenhouses for 3 years and irrigated with treated waste water from 2 citrus processing plants in central Florida. No harmful effects were observed from the use of treated citrus waste water. Supplemental fertilization was necessary to sustain the trees because treated citrus waste water was low in nutrients. Observations of young and mature citrus trees irrigated with untreated citrus waste water under field conditions indicated that it is feasible to grow citrus with citrus waste water. Both quantity and quality of the waste should be considered in the design and manage-ment of irrigation systems for disposal of waste water. Soil in the citrus grove served as a filtering system to waste water. A marked reduction in the BOD, COD, and N contents were found as the waste water percolated through the soil profile.
The results were similar to that obtained by biological treatment of citrus waste water by aeration. Fruit juice quality was not affected by irrigating with citrus waste water. Soil analysis showed little change from samples collected before and after citrus processing seasons. Leaf analysis showed absorption of N, K, and Na in trees irrigated with citrus waste water. The potential practical applica-tions of the data are discussed. (Morgan-Florida) W74-07603

PART I - A CONCEPTUAL MODEL FOR A TERRESTRIAL ECOSYSTEM PERTURBED WITH SEWAGE EFFLUENT, WITH SPECIAL REFERENCE TO THE MICHIGAN STATE

UNIVERSITY WATER QUALITY MANAGE-MENT PROJECT; PART II - A PERSONALIZED BIBLIOGRAPHI C RETRIEVAL PACKAGE FOR RESOURCE SCIENTISTS,

Michigan State Univ Univ., East Lansing. Dept. of

W. H. Conley, and A. R. Tipton.

Available from the National Technical Informa-tion Service as PB-232 002, \$5.50 in paper copy, S1.45 in microfiche. Completion Report, Michigan Institute of Water Research, East Lansing (November 1973), 140 p. OWRR A-063-MICH(1). 14-31-0001-3522

Descriptors: *Waste water disposal, *Effluents, *Sewage treatment, Ecosystems, Management, *Land disposal, Irrigation, *Bibliographies, Model studies, *Information retrieval, Water quality, Water reuse.

Part I contains discussions of management and design problems, components of terrestrial ecosystems, and specific site descriptions, all as they pertain to the sewage effluent spray program of the Michigan State University Water Quality Management Project. Part II is a description of a 2,500 citation bibliography specifically oriented towards sewage effluent treatments. A retrieval system is currently operative and available for interested res W74-07606 rested researchers.

USING SEWAGE EFFLUENT AND LIQUID DIGESTED SLUDGE TO ESTABLISH GRASSES AND LEGUMES ON BITUMINOUS STRIP-

Pennsylvania State Univ., University Park, School of Forest Resources.

W. E. Sopper, L. T. Kardos, and B. R. Edgerton. Available from the National Technical Information Service as PB-232 069, \$5.00 in paper copy, \$1.45 in microfiche. Pennsylvania Institute for Research on Land and Water Resources, University Park, Research Project Technical Completion Report, March 1974. 153 p, 19 fig, 58 tab, 43 ref. OWRR B-047-PA(3). 14-31-0001-3639.

Descriptors: *Strip mine wastes, Sewage, Ef-Descriptors. Strip mine wastes, Sewage, Legumes, Huents, Sludge, Lysimeters, Grasses, Legumes, Metals, Acidity, Nitrogen, Leachate, *Sewage disposal, Spoil banks, *Vegetation establishment, Liquid wastes, *Water reuse, *Sludge treatment.

Six large lysimeters were filled with strip-mine spoil material. The spoil was then seeded with 8 grass and 8 legume species and then treated with sewage effluent and liquid digested sludge at the following treatment rates: control (no treatment), one-inch effluent plus one-inch sludge combina-tion (1E + 1S), and two-inch effluent plus two-inch sludge combination (2E + 2S). The spoil was ririgated weekly during the period May 24 to Sep-tember 21, 1972. The results indicated that treattember 21, 1972. The results indicated that treatment ameliorated the harsh site conditions and greatly facilitated establishment of the grasses and legumes. The grasses did much better than the legumes in both dry matter production and percent areal cover of the spoil. Weeping lovegrass and Blackwell switchgrass gave the best growth response of the grasses with 11,067 and 4,689 pounds of dry matter per acre, respectively, with the 2E + 2S treatment. Bristly black locust gave the 2E + 25 treatment. Bristly black focust gas the best growth of the legumes with 1812 pounds per acre averaged over both treatment rates. Weeping lovegrass, Blackwell switchgrass, Reed canarygrass and deertongue gave the best percent-age cover of the spoil with 100, 100, 100 and 96 percent areal cover respectively on the 2E + 2S treatment. Ladino clover (99), bristly black locust (90), Iroquois alfalfa (90), sericea lespedeza (90), and sweet clover (90) also gave good cover on the 2E + 2S treatment. Highest concentrations of metals and lowest concentrations of nitrogen were found in leachate from the control spoil. Leachate from spoil receiving the 2E + 2S treatment had the lowest concentrations of metals and acidity, and the highest concentrations of nitrogen, more favorable for grass and legume establishment.

W74-07612

W74-07721

WATER QUALITY AND TREATMENT OF DOMESTIC GROUNDWATER SUPPLIES, Illinois State Water Survey, Urbana For primary bibliographic entry see Field 5F. W74-07637

ESTIMATION OF IMPERVIOUSNESS AND SPECIFIC CURB LENGTH FOR FORECAST-ING STORMWATER QUALITY AND QUANTI-

Metropolitan Washington Council of Governments, Washington, D.C. Dept. of Health and Environmental Protection. For primary bibliographic entry see Field 5B. W74-07640

A STREAMFLOW MODEL FOR METROPOLITAN PLANNING AND DESIGN, Metropolitan Sanitary District of Greater Chicago. For primary bibliographic entry see Field 2A.

WATER RESOURCES MANAGEMENT FOR METROPOLITAN WASHINGTON: ANALYSIS OF THE JOINT INTERACTIONS OF WATER AND SEWAGE SERVICE, PUBLIC POLICY AND LAND DEVELOPMENT PATTERNS IN AN EXPANDING METROPOLITAN AREA.

Metropolitan Washington Council of Governments, D.C.

For primary bibliographic entry see Field 6B. W74-07723

APPENDICES TO WATER RESOURCES MANAGEMENT FOR METROPOLITAN WASHINGTON: ANALYSIS OF THE JOINT IN-WASHINGTON: ANALYSIS OF THE JOINT IN TERACTIONS OF WATER AND SEWAGE SER-VICE, PUBLIC POLICY, AND LAND DEVELOPMENT PATTERNS IN AN EXPAND-ING METROPOLITAN AREA. Metropolitan Washington Council of Govern-

ments, D.C.

For primary bibliographic entry see Field 6B. W74-07724

PRICING OF INDUSTRIAL WASTEWATER TREATMENT SERVICE,
Connecticut Univ., Storrs. Dept. of Agricultural

R. L. Leonard

Available from the National Technical Information Service as PB-232 185, \$6.75 in paper copy, \$1.45 in microfiche. Connecticut Institute of Water Resources, Storrs, Report No 20, November 1973, 64 p, 8 tab, 38 ref, 4 append. OWRR B-006-CONN(1). 14-31-0001-3266.

Descriptors: *Pricing, *Industrial water, *Computer models, *Waste water treatment, Mu-Descriptors: nicipal wastes, Biochemical oxygen demand, Chemical oxygen demand, Capital costs, Operating costs, Maintenance costs, Marginal costs, Mathematical models, Simulation analysis, Activated sludge, *Treatment facilities, *Pollution taxes(Charges).
Identifiers: Waste water management, Effluent

charges, Pricing parameters, Contaminants, Load-

A component pricing method was developed for allocating actual treatment costs in proportion to the marginal cost for industry's volume and each priced contaminant. The component pricing system can be applied to capital cost as well as operating and maintenance cost. Charges are usually in the form of surcharges based on the weight of selected contaminants in excess of specified concentrations. A charge for volume and for the entire weight of each priced contaminant is

Group 5D—Waste Treatment Processes

recommended. The selection of pricing parameters depends on the treatment process and wastewater characteristics. Biochemical oxygen demand (BOD) and suspended solids despite limitation are the major current and classical cost determinants for conventional primary and secondary treatment and have been the most common pricing parameters. More comprehensive measures of pollutional content are needed for allocating the cost of more advanced treatment processes to account for dispersed and difficult to degrade materials that can enter the aquatic environment. Cost data and computer models developed for preliminary design of water pollution control facilities can be used in estimating component marginal costs. A management model was derived from a design model. The operation of an existing treatment plant was simulated, and estimates of treatment were encouraging, but additional comparison of simulation results with operating plants is recommended. (Heltgott-Connecticut)

ACTIVATED SILICA IN WASTEWATER COAGULATION,

Michigan Univ., Ann Arbor. Environmental and Water Resources Engineering.
W. J. Weber, Jr., and L. H. Ketchum, Jr. Available from the National Technical Informa-

w. J. Weber, Jr., and L. H. Ketchum, Jr.
Available from the National Technical Information Service as PB-232 454, \$11.50 in paper copy,
\$1.45 in microfiche. Environmental Protection
Agency, Athens, Georgia, Report EPA-670/2-74047, June 1974. 146 p, 52 fig, 6 tab, 81 ref. EPA
Grant 17030 DUW.

Descriptors: *Waste water treatment, *Coagulation, *Silica, Lime, *Alkalinity, Phosphates, Calcium, Sewage treatment, Storm water.

Water.

Identifiers: *Activated silica, *Lime treatment,
Low alkalinity waste waters, *Chemical treatment.

The role of activated silica in coagulation of wastewaters with lime was examined. Laboratory studies were conducted on synthetic wastewaters to simulate certain wastewater characteristics and verification studies were conducted on samples of natural waters and wastewaters. For high alkalinity wastewaters activated silica provides no substantial benefit; reasons for the loss of effectiveness are discussed. For low alkalinity wastewaters however, significant (3 to 10-fold) reduction in lime requirement is possible; the addition necessary to accomplish this lime reduction is small, 2 to 4 mg/l as \$102. In low alkalinity wastewaters high in phosphate concentration (approximately 7 mg/l as PO4) coagulation is accomplished with low lime addition only; multinuclear silica is as effective and in most cases more effective than activated silica. Activated silica-lime coagulation carries no risk of adding foreign materials to the treated water in the event of chemical carry-over; and it adds no anionic salts to the treated water, only hydroxide is added which may be neutralized by acids if the resulting pH is too high. This treatment scheme is proposed for low alkalinity wastewaters; it may provide a convenient method of treating storm and combined sewer discharges which are commonly low in alkalinity. (EPA)

ADSORPTION FROM AQUEOUS SOLUTION, Michigan Univ., Ann Arbor. Environmental and Water Resources Engineering.

Water Resources Engineering.
W. J. Weber, Jr., and P. J. Usinowics.
Available from the National Technical Information Service as PB-232 453, \$15.00 in paper copy, \$1.45 in microfiche. Environmental Protection Agency, Cincinnati, Ohio, Report EPA-670/2-74-012, June 1974. 236 p., 130 ref, 4 append. EPA Project 17020 EPF.

Descriptors: *Waste water treatment, *Mathematical models, *Activated carbon, *Kinetics, *Adsorption, *Forecasting, Model studies, Chemical oxygen demand, Mixing. A model based on material balance concepts and second-order reaction kinetics is presented for prediction of the performance of expanded-bed adsorption systems for treatment of complex mixtures of dissolved organic materials in aqueous solution. The model utilizes system parameters measured or calculated from bench-scale batch experiments, correlative techniques, and hydrodynamic considerations. The major focal point of these investigations is the description of the mixtures as composite solutes by using an overall concentration parameter (chemical oxygen demand, COD) and mathematical treatment of the mixtures as single-solute systems for prediction of continuous flow adsorber breakthrough profiles. (EPA)

OXYGENATION OF AQUEOUS BODIES USING LIQUID OXYGEN-LOXINATION, Midwest Research Inst., Kansas City, Mo. T. D. Bath, W. Garner, and A. E. Vandegrift.

T. D. Bath, W. Garner, and A. E. Vandegrift. Available from the National Technical Information Service as PB-232 455 \$6.00 in paper copy, \$1.45 in microfiche. Environmental Protection Agency, Report EPA-670/2-74-048, June 1974, 52 p, 14 fig, 8 tab, 50 ref. Project EPA 17050 EEY 14-12-168.

Descriptors: *Oxygenation, *Waste water treatment, *Aeration, *Aerobic treatment, Environmental engineering, Oxygen demand, Oxygen requirements, Pollution abatement, Waste assimilative capacity, *Water pollution control. Identifiers: *Liquid oxygen, Loxination, Mass transport coefficient, Sorption efficiency.

An experimental system was designed, constructed, and tested for the introduction of oxygen in the liquid state (LOX) into a body of water at 7 to 30C. The sorption of LOX, both by static water columns and by flowing water columns, was examined. Sorption efficiency and mass-transfer coefficients were calculated. Under experimental conditions investigated, these coefficients did not appear significantly different from those observed for gaseous oxygen. Water temperature, initial dissolved-oxygen concentration, and shear at the point of oxygen injection were less significant in affecting the mass-transfer coefficients than was gross water turbulence. The mass-transfer coefficients correlated with the corresponding Reynolds number. (EPA)

BOD, SOLIDS AND NUTRIENT REMOVAL BY FOAM FLOTATION,

San Jose Dept. Public Works, Calif.

Available from the National Technical Information Service as PB-232 184 \$7.00 in paper copy, \$1.45 in microfiche. Environmental Protection Agency, Cincinnati, Ohio, Report EPA-670/2-73-096, June 1974. 71p, 20 fig, 10 tab, 11 ref. EPA Grant WPRD 30-01-67.

Descriptors: *Sewage treatment, *Biochemical oxygen demand, *Nutrient removal, *Flotation, *Waste water treatment, *Suspended solids, Effluents, Water pollution(Treatment), Phosphorus, Costs, Treatment facilities. Identifiers: *Foam flotation.

The results of a field demonstration project to investigate the removal of BOD, suspended solids and nutrients from a secondary effluent flowstream by the foam flotation process are presented. Two major tasks were accomplished: (1) operation of and the accumulation of data from a 0-10 gpm foam flotation pilot plant using secondary effluent from the San Jose-Santa Clara Water Pollution Control Plant, and (2) economic evaluation of the foam flotation process. It was found that efficient phosphorus and suspended solids removals and an improved effluent saturated with oxygen could be effected by the foam flotation

process. Based on a 10 MGD plant, the projected costs for the foam flotation process were shown to be 5.76 cents/1000 gallons for chemicals and power. (EPA) W74-07742

TREATMENT METHODS FOR HEAVY METAL-CONTAINING LIQUID WASTE (IN JAPANESE), T. Ishihara.

PPM, Vol 5, No 2 p 26-33, February, 1974. 10 fig, 7 tab. 13 ref.

Descriptors: *Waste water treatment, Reduction(Chemical), Oxidation, *Biological treatment, Adsorption, Flotation, Neutralization, Liquid wastes, *Heavy metals, *Waste treatment. Identifiers: Sulfurization.

Neutralization, sulfurization, reduction, oxidation, biological treatment, ion flotation, and adsorption are discussed with respect to heavy metal-containing liquid wastes. The neutralization method, in which metal ions in solution are settled and form hydroxides, is the most widely used for recovering heavy metals. Other methods are usually applied in combination with the neutralization method either as pretreatment (biological, oxidation, or reduction), or post-treatment (adsorption or sulfurization) methods. (Sanduski-Franklin)

THE TREATMENT OF WASTE WATER FROM INDUSTRIES AND COMMERCE IN PUBLIC PURIFICATION PLANTS (IN GERMAN), Kantonales Amt fuer Gewasserschutz, Sankt Gal-

len (Switzerland).

Industrieabwaesser, p 8-11, 1973. 6 ref.

Descriptors: *Waste water treatment, *Treatment facilities, *Activated sludge, Domestic wastes, *Industrial wastes, *Feasibility studies, Efficiencies, *Water purification.
Identifiers: *Joint treatment.

Most domestic wastewater can be treated in public purification plants without problems and in these mechanical-biological plants a balance can be maintained which is disturbed only by the entry of industrial wastewater. Thus industrial wastewater must be analyzed and its effect on the purification process studied prior to its discharge to an existing facility if feasible. If the facility is inadequate, the wastewater goes to a regional purification plant. For joint treatment of industrial and domestic wastewater, certain procedures and requirements, detailed herein, must be followed. (Sanduski-Franklin)

REVERSE OSMOSIS PROCESS AND ITS AP-PLICATION, (IN JAPANESE), K. Mori, and H. Tsuge.

Kobe Steel Engineering Reports, Vol 24, No 1, p 20-26, January, 1974. 12 fig, 2 tab, 54 ref.

Descriptors: *Waste water treatment, *Ion exchange, Research and development, *Reverse osmosis, *Heavy metals, Separation techniques, Reviews, Industrial wastes, *Membrane processes. Identifiers: *Japan(Kobe).

The status of research on reverse osmosis is briefly reviewed. Recent work conducted at Kobe Steel Ltd. which includes preparation of semipermeable membranes and separation of heavy metal ions from plating rinse water is discussed. (Sanduski-Franklin) W74-07750

Waste Treatment Processes—Group 5D

THE DESIGN, PLANNING AND CONSTRUC-TION OF A 45 INCH DIAMETER WATER MAIN ACROSS A CONGESTED AREA OF WEST BROMWICH.

South Staffordshire Waterworks Co. (England). Distribution Dept. For primary bibliographic entry see Field 8A.

W74-07751

SNODLAND-IGHTHAM REGIONAL. THE DRAINAGE SCHEME: DESIGN AND OPERA-TION, R. W. Kellock.

Water Pollution Control, Vol 72, No 8, p 658-665, 1973. 7 tab.

Descriptors: *Sewage treatment, *Treatment facilities, Pumping plants, Flow measurement, Equipment, Sludge treatment, *Operation and Maintenance, *Data collections, Performance, *Waste water treatment.

Identifiers: Facilities extension, *United Kingdom(Snodland-Crouch).

As a result of investigations since the late 1950's, extension to the treatment works at the Snodland and Crouch areas has been undertaken. There are six pumping stations and six ejector stations conveying sewage a maximum of 16 km. All stations are of a standard design, fitted with dataphonic equipment, and maintained by one crew of two men. Sewage treatment is examined together with equipment employed at the facilities. Sludge treatment and operational procedures are examined. (Sandoski-Franklin) W74-07752

A SIMPLE METHOD FOR RETENTION BASIN DESIGN.

Oakland County Drain Commissioner's Office, Pontiac, Mich.

G. Yrjanainen, and A. W. Warren. Water and Sewage Works, Vol 120, No 12, p 35, 41-42, December, 1973.

Descriptors: *Storm runoff, Retention, *Design criteria, *Mathematical studies, Outlets, *Storage requirements, *Treatment facilities.

Identifiers: *Retention basins.

Due to the development of land for agrarian, residential, commercial, or industrial use, the temporary storage of storm runoff in an onsite retention basin has become essential because of inadequate outlets for the increased storm runoff created. Because of ever increasing construction costs and the infeasibility of installing large-diameter storm drains, the concept of ultimate design or improvement of collector storm water system water systems is impractical. Thus, retention basins that meter or restrict flow, are adequate alternatives. Design methods, mathematical deriva-tion for an orifice outlet, derivation for a constant are given. (Sanduski-Franklin)
W74-07753

AUTOMATION OF THE CONTROL AND OPERATION OF WATER POLLUTION CON-

Norwich Sewage Treatment Works (England). P. Cotton.

Water Pollution Control, Vol 72, No 8, p 635-657, 1973 25 ref

Descriptors: *Automation, Equipment, *Water pollution control, Data collections, Operation and maintenance, *Computers, Computer programs, Control systems, Filtration, Sedimentation, Equipment, Activated sludge, Sludge treatment, Sludge disposal, *Sewage treatment, Biological treatment.
Identifiers: *United Kingdom.

The development of automation for water pollution control does not appear to have matched that in many other industries due mainly to the following factors: inadequacy in fundamental process design knowledge; lack of investment and hence development in process-control equipment; lack development in process-control equipment; lack of coordination between plant designers and plant operators; relatively wide range of flow rates coupled with the rapid changes in character and strength of crude sewage; and, methods of financing both capital and running expenses of sewage treatment. Existing and potential systems of automation of individual process units are discussed with respect to their coordination in providing a greater degree of automatic operation. The func-tion and expected advantages of the computer-controlled system at Norwich, England is described. (Sanduski-Franklin)

REDEVELOPMENT OF HAVEN SEWAGE-TREATMENT WORKS, COLCHESTER,

R. Suriyadasa. Water Pollution Control, Vol 72, No 8, p 693-704, 1973. 6 tab. 1 ref.

Descriptors: *Sewage treatment, *Treatment facilities, Equipment, Pumping plants, Storage tanks, *Storm runoff, Sedimentation, Biological tants, Storm funding, Sedimentation, Biological treatment, Activated sludge, Tertiary treatment, Sludge treatment, Sludge disposal, Powerplants, *Control systems, *Costs, Waste water treatment. Identifiers: Facilities extension, *United Kingdom(Colchester).

Redevelopment of the Haven sewage treatment works, constructed in 1884, was initiated in 1901, completed in November 1970, and stressed mainly extensions to the main drainage system and sewage treatment works. Described are the lowlevel pump house, sewage treatment, sludge treat-ment and disposal, power generation, central con-trol, aesthetics, and costs. (Sanduski-Franklin) W74-07759

LIME S SLUDGES. STABILIZATION OF PRIMARY

National Environmental Research Center, Cincin-

nati, Ohio J. B. Farrell, J. E. Smith, Jr., S. W. Hathaway, and

Journal Water Pollution Control Federation, Vol 46, No 1, p 113-122, January, 1974. 3 fig, 9 tab, 15

Descriptors: *Sludge treatment, *Treatment facilities, *Pilot plants, Investigations, Iron, *Lime, Pathogenic bacteria, Aluminum, Filtration, Hydrogen ion concentration, Odor, *Waste water treatment, Water pollution control, Effluents, Identifiers: *Chemical treatment.

Preliminary studies conducted on sludges supplied by the Lebanon. Ohio wastewater treatment faciliby the Lebanon, Onio wastewater treatment facility's pilot plant operation indicated that costs of lime treatment would be low, pathogens and odor greatly reduced, and filterability improved. These findings led to lime treatment of sludge on a plant scale during alum and iron addition experiments. The following results are reported: lower sludge solids are obtained when alum and iron are added to the primary clarifier; the addition of lime to alum and iron chemical-primary sludges increases the vacuum filter yields to reasonable rates; lime addition does not make the sludges chemically sta-ble; and the pH eventually falls and surviving bacteria may return if conditions are favorable lime treatment of sludge raising it to a pH of 11.5 reduces bacterial hazard to a negligible value. (Sanduski-Franklin)

MAJOR WASTEWATER TREATMENT PLANT TO BE UPGRADED,
Malcolm Pirnie, Inc., White Plains, N.Y.

W74-07760

J. H. Foster.

Public Works, Vol 104, No 12, p 47-50, December 1973. 2 fig. 3 tab.

Descriptors: *Waste water treatment, *Sewage treatment, *Treatment facilities, Economic efficiency, *Construction costs, Nitrification, Laboratory tests, Phosphorus, *Design criteria, Sedimentation, Activated sludge, Filtration, Disinfection.

Identifiers: *Cleveland(Ohio). Phosphorus removal

Cleveland, Ohio's Southerly Treatment Plant, in meeting the most cost effective solution, is an example of designing to meet high effluent quality standards where major financial investments were required to modify facilities that have been outmoded according to present regulations. As a prelude to finalizing design concepts and selection of unit treatment processes, prototype and bench scale studies were made to determine process parameters for nitrification and phosphorus removal. Based on these studies and evaluation of data on current and future conditions, a treatment system was selected consisting of primary sedimentation, a two-stage activated sludge process, and effluent polishing by filtration and disinfec-The basic design criteria for the expanded facilities now under design are tabulated. Con-struction of facilities is planned to start during 1974 at an estimated cost of approximately \$160 million. (Sandoski-Franklin) W74-07761

CARTMEN DEVISES TECHNIQUE FOR DISPOSING OF 3.5 MILLION GALLONS OF LIQUID DISCARDS ANNUALLY.
Solid Waste Management, Vol 17, No 1, p 12-13, 24, 80, 105, January 1974.

Descriptors: *Waste treatment, *Liquid wastes, *Waste disposal, *Canada, *Incineration, Equip-ment, Treatment facilities, Storage tanks, Screens, Gages, Measurement, Instrumentation,

In order to accommodate the disposal of the vast quantities of liquid and sludge wastes generated by an excess of 6500 containerized commercial and industrial accounts in Canada's Ontario Province, the Superior Sanitation Services, Ltd. installed a modified Garver-Davis incinerator at its plant. Not long after the plant opened, difficulties became evident in the hauling, burning, and handling aspects of the enterprise. As a result of experimentation, watertight modular containers have been tation, watertight modular containers have been constructed and equipped with various systems of pipes, valves, and sieves designed for screening out the foreign solid objects as the unit is either filled or emptied. To compensate for the differences in Btu properties of the various kinds of refuse handled, to reduce the incidence of necessity for supplemental support fuel, and to maintain the more evenly burging mixture in the core more-evenly burning mixture in the combustion chamber, the storage tanks have been equipped with control gages and metering valves for blending appropriate proportions of each type of liquid. (Sandoski-Franklin) W74-07762

THE DETERMINATION OF HEAVY METALS IN DOMESTIC SEWAGE TREATMENT PLANT

Toronto Univ. (Ontario). Dept. of Geology. For primary bibliographic entry see Field 5A. W74-07763

EXPERIMENTAL STUDY OF THE PROTECTIVE ABILITY OF WATER-TREATMENT PLANTS WITH RESPECT TO SOME SUBSTANCES OF CAPROLACTAM PRODUCTION (IN RUSSIAN), Nauchno-Issledovatelskii

Institut Gigieny. Moscow (USSR). K O Lastochkina

Group 5D—Waste Treatment Processes

Gig Sanit, Vol 37, No 11, p 109-110, 1972. Identifiers: *Caprolactam pr production, Hexanones, *Chlorination, Cyclohexanol, Production, Treatment facilities, *Water treatment, *Waste water treatment.

Treatment of water with a coagulant (aluminum sulfate) and subsequent filtration through a sand filter reduces the content of deleterious sub-stances of caprolactam production. Caprolactam is resistant to the action of Cl. Cyclohexanol, cyclohexanone and its oxime probably react with Cl, which lowers their content in water; the formation of Cl derivatives is possible.--Copyright 1973, Biological Abstracts, Inc. W74-07771

INORGANIC NITROGEN REMOVAL IN A COMBINED TERTIARY TREATMENT-MARINE AQUACULTURE SYSTEM - II. ALGAL BIOASSAYS,

Woods Hole Oceanographic Institution, Mass. For primary bibliographic entry see Field 5C.

NEW SLUDGE PROCESSING PLANT OF THE BEESTON AND STAPLEFORD URBAN DISTRICT COUNCIL.

Water and Water Engineering, Vol 77, No 931, p 341-343, September 1973.

Descriptors: *Waste water treatment, *Sludge treatment, *Dewatering, Treatment facilities, *Chemicals, Mixing, Separation techniques, Fil-tration, Equipment, Construction costs. *United Kingdom(Beeston-Identifiers: Stapleford)

After completing investigations involving pilot plants, long-term analytical work, and negotiations with industrialists, it has been recommended that the installation of a mechanical dewatering plant be undertaken and that provision be made for the tankering of sludge to this central location. In the case of the Beeston installation, a system of chemical conditioning followed by filter pressing was recommended. The chemicals are mixed with the sludge to promote easier separation of water from solid matter. The filter pressing involves straining water under pressure through a fine fabric to leave a cake on the fabric. (Sandoski-Franklin)

A STUDY OF POLLUTANT DISCHARGES FROM REACTOR OPERATIONS UTILIZING ULTRACENTRIFUGATION TECHNIQUES, Oak Ridge Gaseous Diffusion Plant, Tenn For primary bibliographic entry see Field 5A.

TRITIUM DISTRIBUTION IN THE NUCLEAR INDUSTRY - THE REQUIREMENTS FOR CONTROL STRATEGIES,

Allied Chemical Corp., Idaho Falls, Idaho. Idaho Chemical Programs Operations Office For primary bibliographic entry see Field 5B.

SOLID FORMS FOR SAVANNAH RIVER PLANT HIGH-LEVEL WASTE. Du Pont de Nemours (E.I.) and Co., Aiken, S.C. Savannah River Plant. R. M. Wallace, H. L. Hull, and R. F. Bradley. Available from NTIS, Springfield, Va., as Rept. No. DP-1335, \$4.00 per copy, \$1.45 microfiche. Report No DP-1335, December 1973. 38 p, 6 tab,

Descriptors: *Radioactive waste disposal, *South Carolina, *Waste storage, *Concretes, *Concrete construction, Waste treatment, Degradation(Decomposition), Safety hazards, Evaluation,

35 ref, append.

Assessment, Chemical analysis, Leaching Leakage, Toxicity, Asphalt, Cements, Corrosion. Leaching, Identifiers: *Retrievable surface storage, Shield-

One option for long-term management of Savannah River Plant high-activity waste is solidification and storage in a retrievable surface facility to be located on the plantsite. This study was made to evaluate candidate solid waste forms and solidification processes, and to determine their applicability to engineered storage of Savannah River Plant waste. The study included: (1) characteristics of the present tank-stored waste, (2) criteria for acceptable long-term waste storage forms, (3) properties of potentially useful solid forms and the associated processes, and (4) evaluation of the potential product forms for Savannah River Plant waste. A summary of the properties of the various solid waste forms and the evaluation of each are given. (Houser-ORNL)

CHEMICAL ENGINEERING DIVISION, WASTE MANAGEMENT PROGRAMS, QUARTERLY REPORT, JULY-SEPTEMBER 1973. Argonne National Lab., Ill. Chemical Engineering

M. J. Steindler, N. M. Levitz, L. E. Trevorrow, T.

N. J. Gering, and B. J. Kullen. Available from NTIS, Springfield, Va., as Rept. No. ANL-8061; \$4.00 per copy, \$1.45 microfiche. Report No ANL-8061, January 1974. 28 p. 3 fig. 9 tab. 32 ref.

Descriptors: *Radioactive waste disposal, *Waste water treatment, *Waste water disposal, *Water chemistry, Research and development, Hydrogen, *Tritium, Water pollution, Treatment, Water purification, Transportation, Safety, Nuclear physics, Toxicity, Hazards, Public health, Plutoni-um, Assay, Assessment, Evaluation, Economic evaluation, Waste storage, "Illinois.

Identifiers: *Waste management. reprocessing.

Quarterly progress is presented on three programs at Argonne National Laboratory for the Division of Waste Management and Transportation of the USAEC. To assess methods for consolidation of fuel-cladding hulls, work to date has been directed toward identifying and evaluating methods for the safe management and consolidation of waste Zircaloy hulls from the chop-leach reprocessing of spent fuel. In a program to identify methods for decontaminating metallic materials and equipment that have been used with plutonium, published decontamination procedures are being reviewed and evaluated. A third program is directed toward evaluation of proposed methods for the storage of tritium and noble-gas fission products. Studies have been directed toward a brief evaluation of the practicability of concentrating the tritium in fuelreprocessing aqueous waste streams by converting the water to oxygen plus a tritium-hydrogen mixture and subsequently passing this mixture through palladium membranes. The results of a limited cost study showed that the power required to move the large volumes of hydrogen through the membranes is, in itself, prohibitively expensive. (Houser-ORNL)

THE TECHNOLOGY OF TRITIUM FIXATION

AND STORAGE,
Parialla-Pacific Northwest Labs., Richland,

L. L. Burger, and J. L. Ryan. Available from NTIS, Springfield, Va., as Rept. No. BNWL-1807; \$4.00 per copy, \$1.45 microfiche. Report No BNWL-1807, January 1974. 36 p. 1 fig. 54 ref.

Descriptors: *Tritium, *Waste storage, *Fuels, *Nuclear wastes, Effluents, Water pollution, Water pollution sources, Atmosphere, Soil con-

tamination, Economic study, Clays, Portland cements, Census, Projections, Forecasting. Identifiers: *Fixation, *Fuel cycle.

The technology of fixation of tritium in a solid form was examined. The principal emphasis was on the storage in solid form of tritium waste from the nuclear fuel cycle with the aim of preventing its significant entry into the biosphere. The basic chemical and technical aspects of known and potential fixation methods and the applicability of these methods to specific sources or types of tritiated waste with some estimate of economics are given. These fixation methods are compared briefly with some other tritium disposal methods. Recommendations for further studies are made. Clays, Portland cement, and hydrides all appear to have merit, depending on the nature (principally degree of dilution) of the tritium waste. (Houser-ORNL) W74-07789

FINAL ENVIRONMENTAL STATEMENT RE-LATED TO THE PROPOSED PERRY NUCLEAR POWER PLANT, UNITS 1 AND 2. Directorate of Licensing (AEC), Washington,

For primary bibliographic entry see Field 5A. W74-07793

COAGULANT RECOVERY AND REUSE IN WATER RECLAMATION SYSTEMS, Virginia Polytechnic Inst. and State Univ.,

Blacksburg.

Blacksburg. P. H. King, and B. H. H. Chen. Available from the National Technical Informa-tion Service as PB-232 257 \$4.00 in paper copy, \$1.45 in microfiche. Completion Report, (1973), 18 p, 10 fig, 1 tab. OWRR A-040-VA(1)

Descriptors: *Water Reuse, *Waste water treatment, *Coagulation, Sludge treatment, Capital costs, Operating costs.

Identifiers: *Alum recovery, Coagulant reuse, Chemical treatment.

A laboratory investigation was conducted to determine the optimum procedure for economical recovery of hydrolyzed metallic coagulants used in chemical treatment of water and wastewater. Attention was primarily focused on alum. Experi-ments were aimed at determining the extent of possible coagulant recovery, the best means of separating and dewatering the remaining solids, and the effectiveness of the recovered coagulant during reuse. An economic analysis was conducted to estimate the capital cost of the process and the savings in chemical cost in operation. A computerized method was developed for determining the breakeven point in terms of treatment plant capacity. W74-07844

THE REMOVAL OF SOLUBLE MERCURY FROM WASTE WATER BY COMPLEXING TECHNIQUES,

Virginia Polytechnic Inst. and State Univ., Blacksburg, Dept. of Chemical Engineering. D. L. Michelsen.

Available from the National Technical Informa-tion Service as PB232 256 \$7.50 in paper copy, \$1.45 in microfiche. Completion report, (1973), 88 p. OWRR A-044-VA(2).

Descriptors: *Mercury, *Heavy metals, *Ion exchange, *Waste water treatment. Identifiers: Mercury removal, *Tannery hair.

Milk proteins, xanthates, modified products, and keratin in various forms can be used for the removal of ionic mercury from water systems. In particular anionic and cationic ion exchange products made from ground tire cord rubber compete very favorably with classical ion exchange resins with regard to capacity, and rate

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Waste Treatment Processes—Group 5D

of pick-up. Cow and pig hair selectively remove ionic mercury and the performance with tannery hair based on equilibrium capacity, rate of removal and pressure drop was as good as classical ion exchange resins. Regenerative studies of ionic mercury from tannery hair with HCl and NaC1 were successful, and a number of scale-up studies including economics were completed to illustrate how tannery hair might be used for the treatment of waste streams containing ionic mercury. The results were very encouraging. W74-07845

ORGANIC WATER IMPURITIES AND EVALUATION OF METHODS FOR THEIR REMOVAL IN WATER MAINS (IN RUSSIAN), Kiev Research Inst. of General Communal Hydrox (IISSN)

Kiev Research Inst. of General Communal Hygiene (USSR).
V. N. Kupyrov, N. I. Omel'yanets, G. I.
Meleshko, and G. I. Panasenko.
Gig Sanit, Vol 37, No 1, p 105-106, 1972.
Identifiers: *Anion exchange resins, Impurities,
*Organic matter, Resins, Rivers, Water mains,
Water purification methods, Waste water treatment. Sorbents.

To determine the effectiveness of water purification methods, a comparative study was made of organic impurities of river water and water in mains that received treatment. The impurity content in river water was 1143 micrograms/l and in the water main 450 micrograms/l. Anion-exchange resins had the best sorption properties for removing such impurities.—Copyright 1973, Biological Abstracts, Inc. W74-07862

MINE DRAINAGE POLLUTION CONTROL VIA REVERSE OSMOSIS,

National Environmental Research Center, Rives, W.V.

R. C. Wilmoth, and R. D. Hill. Mining Engineering, Vol 25, No 3, p 45-47, March, 1973. 2 fig. 3 tab, 7 ref.

Descriptors: Waste water treatment, *Reverse osmosis, *Mine water, *Mine drainage, *Pollution abatement, Mine wastes, Iron, Manganese, Calcium sulfate, Acid mine water, Neutralization, Membrane processes.

Membrane processes.
Identifiers: *Neutrolysis, Spiral wound membrane, Tubular membrane, Hollow fine fiber membrane.

Reverse osmosis can be successfully applied to most mine discharge waters. Product quality is directly dependent on concentrations on the brine side of the membrane. Iron and manganese are the most critical constituents of mine drainage waters in treatment to potable standards. Two major causes of membrane fouling are iron and calcium sulfate. Fouling of the membrane surface is held to a minimum by maintaining a brine flow to product flow of 10:1. Design of the complete reverse osmosis system must begin with a definition of the quality of product desired. Post-treatment is necessary for potable water. The 'neutrolysis' process involves neutralizing the brine with lime and returning the neutralized supernatant to the feed of the reverse osmosis unit. The feed had a pH of 4.9 and precipitation of iron was avoided. Up to 99% of the water applied to the unit was recovered as useable water. The neutralized sludge was pumped into abandoned underground mines. Periodic blowdowns to remove manganesus required. Current estimates of cost per thousand gallons of product vary between \$0.35 and \$1.50, depending on the plant size, water quality, disposal technique, and other factors. (Gray-NWWA)

SUN OIL DEVELOPS WATER REUSE PROGRAM, Sun Oil Co., Toledo, Ohio.

Sun Oil Co., Toledo, Ohio. E. F. Mohler, Jr., and L. T. Clere. The Oil and Gas Journal, Vol 71, No 37, p 111-116, September 10, 1973. 1 fig, 8 tab.

Descriptors: *Reclaimed water, *Water reuse, *Waste water treatment, Biodegradation, Biochemical oxygen demand, Phenols, Water quality, Water conservation, Sulfur compounds, Biological treatment, Cooling towers, Cooling water, Filters, Chemical oxygen demand. Identifiers: *API Waste water separator, BODTOC ratio, COD-TOC ratio, Refinery effluent water, *Waste reuse.

The water reuse program developed at Sun Oil Company's Toledo refinery has reduced water consumption to about 28 gallons of water per barrel of crude oil refined, as compared to the national average of about 200 gallons of water. A flow sheet shows the waste-water reuse and biooxidation flow. Ballast water from tankers is treated in the same system. The initial step in the process involves removal of sulfur compounds. Induced draft cooling towers are used to effect biooxidation of over 99.9% of the phenolic compounds in the water. Total organic removal performance exceeds 90%. Corrosion rate is monitored and longterm rate on steel is 1.5 mils per year. There is no evidence of increased deterioration of redwood in the cooling towers since reuse of water began. Final treatment of the refinery effluent is by filtration through sand filters. (Campbell-NWWA) W74-07882

CORROSIVE EFFECTS OF POTABLE WATER, Denver Water Dept., Colo. For primary bibliographic entry see Field 8G. W74-07886

SMELTER GASES YIELD MERCURY, Outokumpu Oy, Helsinki (Finland). J. Kangas, E. Nyholm, and J. Rastas.

J. Kangas, E. Nyholm, and J. Rastas. Chemical Engineering, Vol 78, No 20, p 55-57, September 6, 1971. 2 fig, 3 ref.

Descriptors: *Mercury, *Air pollution, *Separation techniques, *Heavy metals, Zinc, Iron, Industrial wastes, Industrial production, Recycling, Food chains. Identifiers: *Smelters, Selenium, Finland, Gas purification.

A process has been developed at Outokumpu Oy in Helsinki, Finland, that allows for recovery of mercury during treatment of SO2-rich gases from smelter or roasting operations, before the gas is sent to sulfuric acid production. Mercury is recovered in metallic form; selenium-bearing residue is recovered as well. Mercury-containing gases coming from the electrostatic precipitators at the temperature of 350 C go to the sulfatizing unit. There the gases contact a counter-current flow of strong sulfuric acid. Mercury and selenium are scrubbed from the gas by the acid. The metals are then separated in the clarifiers. The precipitate is washed with water, thus only insoluble metals form the residue. The residue is then passed through a filter press for further purification yielding up to 50% Hg and 10% Se. Separation of the two metals occurs in a 650-700 kiln, where Hg vaporizes to be later condensed at 99.99% or better purity. (Oleszkiewicz-Vanderbilt)

ODORS EMITTED FROM RAW AND DIGESTED SEWAGE SLUDGE,

Saint Louis Metropolitan Sewer District, Mo. B. A. Rains, M. J. DePrimo, and I. L. Groseclose. Copy Available from GPO Sup Doc as EP1.23:670/2-73.098, \$1.15; microfiche from NTIS as PB-232 369, \$1.45. Environmental Protection Agency, Technology Series, Report EPA-670/2-73-098, December 1973. 68 p. 19 fig. 13 tab, 23 ref. EPA Project 11010EZQ. Grant WPD 23-01-68, Program Element 1BB033.

Descriptors: *Waste water treatment, Gas chromatography, Odor, *Sewage sludge, *Pollutant identification, *Sludge treatment, Pollution abatement.

Identifiers: *Odor control, Malodors, Odor abatement.

Odors emitted during thickening of raw and secondary sludge have been responsible for adverse criticism at many sewage treatment plants. This study was undertaken to identify typical odor causing substances and evaluate selected conventional methods for controlling or eliminating these substances. A styrofoam dome covering a sludge thickener was utilized to control atmospheric conditions and concentrate odors. Field collected vapor samples were analyzed using gas chro-matography techniques. Analyses using both polar and nonpolar column material indicated that the major odor causing compounds were mercaptans and amines. Other compounds which were minor contributors to odor were aldehydes, alcohols, and organic acids. Odor control methods selected for study included air dilution, activated carbon adsorption, and chlorine oxidation. Air dilution using cyclic operation of an exhaust fan was an effective means of odor control when outside atmospheric conditions were conducive to odor dissipation. Passing vapors through activated carbon filters was not completely effective in odor control since a detectable residual odor remained. A 1.5 mg/l solution of chlorine was effective in removing all odors from vapor samples bubbled through the solution. (EPA) W74-07960

HYDROBIOCHEMICAL EFFECTS OF SPRAYING WASTE-TREATMENT EFFLUENT IN ST. PETERSBURG, FLORIDA,

Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 5C. W74-07978

WATER TREATMENT SYSTEM.

Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Mechanical Engineering. For primary bibliographic entry see Field 5F. W74-07979

INDUSTRIAL LIQUID WASTE SURVEYS: TRAINING MANUAL. Environmental Protection Agency, Cincinnati, Ohio. Water Quality Office.

For primary bibliographic entry see Field 5G. W74-07988

OPTIMAL TIMING AND SIZING OF A CON-JUNCTIVE URBAN WATER SUPPLY AND WASTE WATER SYSTEM WITH NONLINEAR PROGRAMMING, Loyola Univ., Los Angeles, Calif.

Loyola Univ., Los Angeles, Calif. M. E. Mulvihill, and J. A. Dracup. Water Resources Research, Vol 10, No 2, p 170-175, April 1974. 6 fig, 1 tab, 16 ref.

Descriptors: Water resources development, *Water supply, Waste water(Pollution), *Water sources, Water treatment, *Waste water treatment, *Recycling, Reclaimed water, Optimization, Timing, Water quantity, Water quality, Effluents, Standards, Constraints, Water users, Capital costs, Decision making, Operating costs, Economies of scale, Planning, Systems analysis, Mathematical models, Water pollution control, *California.

*California.
Identifiers: *Nonlinear programming, *Los Angeles(Calif.), *Conjunctive operation, *Cost minimization, Capacity expansion, Urban areas.

A mathematical model of a conjunctively-operated urban water supply and wastewater system is formulated and applied to the city of Los Angeles. The objectives are to: (1) minimize the cost of supplying water from several sources, including the

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5D-Waste Treatment Processes

provision for recycling reclaimed water; and (2) determine the capacity expansion schedule (timing and sizing) of the water and wastewater treatment processes. The water sources vary in quality. quantity and cost. Constraints on both water quantity and quality are included. The model consists of the minimization of a concave objective func-tion subject to linear constraints. Capital and operation and maintenance costs exhibit economies of scale. A multilevel solution technique is developed to determine the minimum cost alternative for a selected planning horizon. The optimal blending of water sources and the optimal capacity expansion of treatment processes are determined such that user quality and quantity requirements are satisfied and effluent standards are met at minimum cost. The model is flexible in that it can be expanded to include additional water quality constituents, advanced wastewater treatment processes, and variations in water quality standards. The improvement over previous studies is that this model combines the water and waste-water subsystems, the major link being the reuse of reclaimed water. This model provides information for decision makers in planning future urban water resources development. (Bell-Cornell) W74-08010

PROCESS AND APPARATUS FOR THE PURIFI-CATION OF A NATURAL BODY OF WATER, W. Whipple, Jr.

U.S. Patent No. 3,755,142, 10 p. 39 fig. 4 ref; Official Gazette of the United States Patent Office, Vol 913, No 4, p 1249, August 28, 1973.

Descriptors: *Patents, *Water purification, *Oxygenation, Pollution abatement, *Water treat-Descriptors: ment, *Waste water treatment, Water quality control, Water pollution control, Boats, Supersatura-

Water is agitated by means of the propeller of a moving boat disposed in such a relation with the oxygen diffuser as to disperse the oxygenated water. The oxygenated water is further agitated by the wake of the propeller so as to cause the super saturated water to be dispersed throughout and mixed with the surrounding mass of untreated water to thereby oxidate the pollutants in the water. On board, the oxygen supply tank, and the heat exchanger as well as the diffuser are arranged so that it will not be necessary to equip the towboat in any way with the necessary oxygenation apparatus. The oxygen which has been volatilized by the heat exchanger is directed through a conduit and into the diffuser so that gaseous oxygen may be emitted in the wake of the propellers and the highly oxygenated water in the vicinity of the diffusers may be agitated by the turbulent flow caused by the propellers and dispersed throughout the surrounding water. (Sinha - OEIS) W74-08019

PIVOTABLE FLUID DIVERTER FOR RECIRU-LATION SYSTEM, Oldham (Robert R.), Inc., Sidney, Ohio.

(Assignee)

R. R. Oldham, and J. H. Wooddell

U. S. Patent No 3,789,986, 5 p, 4 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 919, No 1, p 159, February 5, 1974.

Descriptors: *Waste water treatment, *Patents, *Sewage treatment, *Water purification, Pollution abatement, Water pollution control, Water quality control, Equipment, Effluents, Liquid wastes, *Separation techniques

The pivotable fluid diverter is rigidly connected to a float device on the surface of the liquid collected in the reservoir where sewage treatment takes place in its final stage. A submersible pump within the liquid recirculates liquid by spraying it through a foraminous header disposed above the liquid level. When the liquid level in the reservoir falls below a predetermined liquid level, the diverter returns sprayed fluid to the reservoir. When the liquid level rises above the predetermined liquid lever, the diverter diverts fluid into the outlet pipe and continues to do so until the predetermined liquid level is restored. (Sinha-OEIS)

APPARATUS FOR AFRATING WATER.

R. W. Conway

U. S. Patent No 3,790,140, 6 p, 4 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 919, No 1, p 198-199, February 5, 1974.

Descriptors: *Patents, *Aeration, *Oxygenation, Waste water treatment, Water treatment, *Pollution abatement, Water quality control, *Water pollution control, Equipment, Water pu-Identifiers: *Venturi device.

Water flowing in a stream is aerated under the influence of a natural pressure head by providing a venturi device through which the water flows as a result of the natural pressure head. The venturi device has a restricting portion through which the water flows to draw air from the atmosphere into the stream of water. As the water flows through the restricting portion, the velocity of the water increases while the pressure of the water decreases. By connecting the restricting portion to the at-mosphere through the conduit, the decreased pressure of the water flowing through the restricting portion draws air from the atmosphere into the stream. This air is entrained by the water and flows with the water through the venturi so that it is constantly dissolved in the water. The venturi includes upper and lower gate members for restricting the flow of water. One of the gate members is movable with respect to the other. A foraminous air diffuser is positioned between the upper and lower gate memebers. A screen is positioned downstream of the upper gate for retarding movement of the air bubble produced to the water surface. (Sinha-OEIS) W74-08023

PROCESS FOR TREATING WATER CONTAMINATED WITH HEXAVALENT CHROMI-

UM, G. J. Nieuwenhuls.

U. S. Patent No 3,791,520, 3 p, 1 fig, 4 ref; Official Gazette of the United States Patent Office, Vol. 919, No. 2, p. 551, February 12, 1974.

Descriptors: *Patents, Pollution abatement, Water pollution control, *Chromium, *Waste water treatment, *Metals, Water quality control, Lead, Ion exchange, Effluents.

Identifiers: *Metal plating industry, Lead chro-

Waste water from plating industries is passed either on a continuous or batch basis, upward through a vessel containing one or more trays holding a water insoluble lead compound in conjunction with a particular carrier matrix which prevents channeling and packing of the bed. The lead compound reacts with the chromium in the waste water to form insoluble lead chromate. The lead chromate is caught on a filter which can be removed through the top of the vessel. Since lead chromate is a pigment in the paint industry, there is no disposal problem. The effluent leaving the vessel may contain a very small amount of ion. This residual lead may be removed by running the effluent through an ion exchange column containing a cation exchange resin such as Dowex 50-W in the hydrogen form. (Sinha-OEIS)

APPARATUS AND METHOD FOR TREATING WASTE LIQUID,

Hydro-Clear Corp., Avon Lake, Ohio. D. S. Ross.

U. S. Patent No 3,792,773, 8 p, 7 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 919, No 3, p 867, February 19, 1974.

Descriptors: *Patents, *Waste water treatment, Pollution abatement, *Sewage treatment, Ffiltration, Water pollution control, Water quality control, *Flocculation, *Coagulation, Effluents, Equipment.

Waste effluent from a sewage treatment plant is treated by using a filter unit having a backwash ar-rangement. The backwash liquid is subjected to flocculation, coagulation and settlement to produce a supernatant, which is introduced directly into the inlet of the filter without returning the backwash liquid to the sewage treatment plant. The solids in the backwash liquid are concentrated and removed without being reintroduced into the sewage treatment plant. (Sinha-OEIS) W74-03026

SUBMERGED TURBINE AERATOR.

Westinghouse Electric Crop., Pittsburgh, Pa.

westinghouse Jetech Chopp, Filisophan, Fa. F. J. Sisk, and C. F. Garland. U. S. Patent No 3,792,840, 3 p, 4 fig, 15 ref; Official Gazette of the United States Patent Office, Vol 919, No 3, p 885, February 19, 1974.

Descriptors: *Patents, *Aeration, *Water treatment, *Waste water treatment, Pollution abatement, Water pollution control, Water quality control, Mass transfer, Equipment, Rotors Identifiers: Turbine rotors.

Processes and apparatus are described for enhancing the mass transfer of oxygen from a sparged air system into a liquid medium by use of submerged turbine rotors. Mass transfer driving force is maximized by the provision of a rotor with vanes only on the upper surface of the rotor platform and having vane tips suitably displaced by the edge of the platform or shroud. Air is sparged from a ring onto the shroud at approximately the intersection of the shroud with a conical fairing projecting downward. The conical fairing serves to preserve the uniform azimuthal air distribution created by the sparge ring. The displacement of the vane tips from the shroud edge permits separation of the liquid vortex stream from the vanes before air flow is encountered and thus prohibits air induc-tion into an attached vortex and thus onto the vane trailing face. Air is delivered uniformly off the shroud underside into the underside of the radial liquid jet which is driven by the vanes on the shroud upper side. The air is dispersed by the shear flow which it encounters and is driven radially outward while rising in discrete bubbles through the liquid jet. By the time the air has freed itself from the jet entrainment and is capable of creating an upwelling flow due to its percolation head, it has been radially dispersed. The result is a ring of air insufflated liquid in upwelling flow at a large radial distance from the rotor. The air congiven rotor power. (Sinha-OEIS)
W74-08027

WASTEWATER TREATMENT USING ELECTROLYSIS WITH ACTIVATED CARBON CATHODE.

M. Kawahata, and K. R. Price.

U. S. Price No 3,793,173, 4 p, 2 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 919, No 3, p 961, February 19, 1974.

Descriptors: *Patents, *Waste water treatment, *Electrolysis, *Activated carbon, Water quality control, Water pollution control, Pollution abatement, *Electrodes, Hydrogen peroxide, Cathodes, Anodes, Electrochemistry, Effluents. Identifiers: Organic carbon.

Use is made of the cathodic reduction of oxygen to form hydrogen peroxide which reacts with organic contaminants in waste water. A hollow porous ac-

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Waste Treatment Processes—Group 5D

tivated carbon cathode is the means by which oxygen-containing flow is introduced into a system wherein wastewater passes between the cathode and anode surfaces. When a current is passed through the wastewater, oxygen is reduced at the cathode and is converted to hydrogen peroxide in the presence of activated carbon. (Sinha-OEIS) W74-08028

METHOD OF TREATING WASTE WATER CONTAINING LIGNINSULFONATE, Mitsui Mining and Smelting Co. Ltd., Tokyo (Japan). (Assignee)
M. Ichiki, and M. Ishii.

U.S. Patent No 3,793,174, 3 p, 1 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 919, No 3, p 961, February 19, 1974.

Descriptors: *Patents, *Waste water treatment, Pollution abatement, Water pollution control, Water quality control, Pulp and paper industry, *Pulp wastes, Flotation, Lignins, Electrolysis, *Flocculation, Anodes, Electrodes. Identifiers: *Ligninsulfonate.

Electrolysis is used in treating waste water containing ligninsulfonate. The ligninsulfonate is the electrolyte, the anode should consist of iron. As electrolysis proceeds, the ligninsulfonic acid ion loses its charge at or in the vicinity of the anode. The ligninsulfonate is rendered insoluble to form flocs. A matter of importance is to minimize the ferrous ions dissolved in the electrolyte. This is achieved by blowing sufficient air into the elec-trolytic cell to change divalent ions to trivalent ion. This air-blowing process serves to prevent the cake from adhering to the inside wall of the electrolytic cell and the floc absorbs enough air so it can float. (Sinha-OEIS) W74-08029

ELECTROLYTIC FLOTATION APPARATUS. Simon-Hartley Ltd., Straffordshire (England). (Assignee)

E. P. Austin, G. D. Kemp, F. A. F. M. Tonelli, and I. Marshall.

U. S. Patent No 3,793,178, 3 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 919, No 3, p 962, February 19, 1974.

Descriptors: *Patents, *Waste water treatment, Water quality control, Water pollution control, Pollution abatement, *Electrolysis, *Flotation, *Bubbles, Electrodes. Identifiers: Gas bubbles.

Gas bubbles generated during electrolysis cause suspended materials to be floated to the surface of the tank. Scraper blades are arranged with their lower edges dipping into the surface of the con-tents of the tank. They are adapted to be driven longitudinally. The liquid to be treated is in-troduced into the tank by flow through at least one elongated tube of conducting material which defines a cathode with respect to an anode mounted within the tube and which extends substantially over the length thereof. (Sinha-OEIS) W74-08030

METHOD AND APPARATUS FOR AERATING BODIES OF WATER, For primary bibliographic entry see Field 5G.

W74-08031

MECHANICAL-BIOLOGICAL WASTE WATER PURIFICATION PLANT,

H. Schnyder. U. S. Patent No 3,794,176, 4 p. 5 fig, 7 ref; Official Gazette of the United States Patent Office, Vol 919, No 4, p 1217, February 26, 1974.

Descriptors: *Patents, *Waste water treatment, Pollution abatement, Water quality control, Water pollution control, Water treatment, *Sludge

digestion, *Activate *Biological treatment. *Activated sludge, Equipment,

A pre-clarifying basin is arranged inside the upper part of a tank. The lower part of the tank defines a sludge digestion zone. The upper part of the tank defines a buffer zone open at the botton and limited laterally by the wall of the tank and side walls of the pre-clarifying basin. A post-clarigying plant has a clarification basin linked with the activated sludge zone and provided with a floating weir connected by a flexible or jointed discharge pipe to a clarified water outlet located some distance below the upper end of the post-clarifying basin. Sludge transferred by vacuum from the post-clarifying plant to the pre-clarifying plant is removed from the sludge digestion zone of the latter by a suitable pump. (Sinha-OEIS) W74-08032

WASTEWATER TREATMENT,

Envirotech Corp., Salt Lake City, Utah. (Assignee) M. M. Zuckerman, and A. H. Molof.

U. S. Patent No 3,794,581, 6 p, 4 fig, 4 tab, 2 ref; Official Gazette of the United States Patent Office, Vol 919, No 4, p 1314, February 26, 1974.

Descriptors: *Patents, *Waste water treatment, *Biological treatment, Pollution abatement, Water quality control, Water pollution control, *Hydrolysis, *Adsorption, Activated carbon, In-dustrial wastes, Effluents.

A system is provided for the treatment of raw wastewater which includes a soluble organic component with a high proportion of a poorly sorbable low molecular weight material. The system in-cludes, in order, biological treatment, hydrolysis, and sorption. During biological treatment, one portion of the low molecular weight material is respired while another portion is converted into a high molecular weight material. After biological treatment, the wastewater is hydrolyzed to convert a substantial portion of the high molecular weight material into low molecular weight material having improved sorbability as determined by percentage adsorption on activated carbon. (Sinha-OEIS) W74-08034

INDUSTRIAL WASTE PROCESSING AP-PARATUS.

U. S. Patent No 3,795,316, 4 p, 3 fig, 3 ref; Official Gazette of the United States Patent Office, Vol 920, No 1, p 96, March 5, 1974.

*Waste Descriptors: *Patents. treatment. *Industrial wastes, *Waste water treatment, Pollu-tion abatement, Water quality control, Water pollution control, Equipment.

Industrial waste handling apparatus has side by side elongate tanks, one a waste receiving and settling tank, and the other a suspended waste filtra-tion tank, with cross flow below liquid level from the one tank to the other. Each of the tanks has an inclinded end portion extending upward to a discharge placed above the liquid level. A solid apron conveyor is placed in the settling tank ex-tending along near the bottom and the inclined end portion to the discharge. A strainer grid is placed above the bottom of the other tank providing a sump for liquid withdrawal. A drag line conveyor with scraper bars moves over the grid and up the incline and a submerged weir in the settling tank over the cross flow prevents buoyant material from escape to the filtration tank. The apron convevor skims surface oil and removes heavy waste. Liquid velocity from the receiving end of the settling tank to the cross flow opening is equal to the speed of the apron conveyor. (Sinha-OEIS) W74-08035 SYSTEM FOR REVERSED OSMOSIS

Industriele Onderneming Wavin, N.V., Zwolle (Netherlands). (Assignee) Van Zon.

U. S. Patent No 3,795,317, 3 p, 5 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 920, No 1, p 96, March 5, 1974.

Descriptors: *Patents, *Reverse osmosis, *Membranes, Water treatment, *Water purifica-tion, Water quality control, Equipment, *Separation techniques, Waste water treatment.

A device for purifying water by reversed osmosis is provided which comprises an auxiliary support-ing plastic tube which has on its inner side a layer of resilient fibrous or fabric-like material on which is disposed a membrane. The auxiliary supporting plastic tube is supported on its outer side by a main supporting tube which, at least on its inner side, has discharge channels extending in the longitudinal direction. Due to the use of an auxiliary supporting plastic tube provided with a fibrous or fabric-like material on which is placed a mem-brane, the thin, easily damaged membranes are protected in transit by the auxiliary supporting plastic tube provided on the outer side. The use of plastic for the auxiliary supporting tubes offers the great advantage that with a very cheap material the membranes can be conveyed without the necessity for pretreatment of the membranes at the location where the inverted osmosis treatment is to be carried out. The device comprises additional main supporting tubes provided with wall apertures, which are enclosed within a closed cylindrical space delimited by plastic closing plates at the two ends, while through apertures in these closing plates the plastic supporting tubes protrude in a perfectly sealing way with respect to the outer side. (Sinha-OEIS) W74-08037

STORAGE AND DISPENSING APPARATUS FOR A REVERSE OSMOSIS WATER PURIFI-CATION SYSTEM,

Desalination Systems, Inc., Escondido, Calif. D. T. Bray

U. S. Patent No 3,794,172, 4 p, 2 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 919, No 4, p 1216, February 26, 1974.

Descriptors: *Patents, *Waste water treatment, *Water purification, *Reverse osmosis, Water quality control, Water pollution control, Equip-

The water storage and dispensing apparatus comprises a closed, pressure resistant container into which purified water from a reverse osmosis water purification unit is delivered and temporarily stored normally under pressure slightly above atmospheric. The pressure in the storage container is maintained by means of releasing a restricted flow of liquid from such container, such as a pressure relief valve or a restricted passageway. Dispensing means for the purified water in the storage container are connected to a dispensing valve. Also connected to the storage container is a supply of impure water, the feed water supplied to the reverse osmosis system. Introduction of this impure water is controlled by a pressure responsive valve which is normally maintained closed by the pressure of the purified water in the storage container through a connection with the purified water supply to the dispensing valve. Opening the dispensing valve causes a reduction of pressure in its purified water supply connection thus opening the pressure responsive valve and allowing in-troduction of impure water under evaluated pressure into the storage container. This pressurizes the purified water in the storage container so that purified water is supplied on demand at elevated pressure to the piping supplying the dispensing valve. (See also W74-08040) (Sinha-OEIS)

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5D—Waste Treatment Processes

VALVE FOR REVERSE OSMOSIS PURIFICA-TION AND STORAGE SYSTEM,

Desalination Systems, Inc., Escondido, Calif. D. T. Bray.

U. S. Patent No 3,794,173, 4 p, 4 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 919, No 4, p 1216, February 26, 1974.

Descriptors: *Patents. *Reverse osmosis. *Waste water treatment, *Water purification, Water quality control, Water pollution control, Equipment.

A valve for a water purification system operating by reverse osmosis combines the functions of a pressure control for the blowdown or brine from the reverse osmosis module, and of a pressure control for a purified water container. The valve also acts as a responsive valve to allow elevated pressure impure water to flow into the purified water container to elevate the pressure of purified water supplied to a dispensing valve when the dispensing valve is opened. (See also W74-08039) (Sinha-OEIS) W74-08040

OSMOSIS-NEUTRALIZATION PROCESS FOR TREATING MINERAL CON-TAMINATED WATERS,

Environmental Protection Agency, Washington,

D.C. (assignee)
R. D. Hill, R. C. Wilmoth, and R. B. Scott. U.S. Patent No. 3,795,609, 6 p, 1 fig, 6 tab, 11 ref; Official Gazette of the United States Patent Office, Vol 920, No 1, p 165, March 5, 1974.

Descriptors: *Patents, Water purification, *Waste water treatment, *Reverse osmosis, *Acid mine water, Water quality control, Pollution abatement, *Demineralization, Filtration, *Neutralization, Minerals, Disinfection, Effluents. Identifiers: Ferrous ion oxidation, pH adjustment.

The method involves reverse osmosis treatment of mineral contaminated water to concentrate the dissolved minerals into a small fraction of the feed stream and concomitantly to separate out at least 50% of the water content of the feed stream as a purified water product stream capable of being safely discharged into the adjoining surface waters. In the instance of acid mine drainage, chemical treatment may be with inexpensive neutralizing agents such as lime, limestone or sodium carbonate. A typical pre-treatment for acid mine drainage is oxidation of ferrous ion, by ozonation, chlorination, or biological processes. Suspended solids may be removed by passage through a filter system. (Sinha-OEIS) W74-08041

MATHEMATICAL MODEL FOR POST AERA-

Environmental Protection Agency, Cincinnati, Ohio. Advanced Waste Treatment Research Lab.

R. Smith, R. G. Eilers, and E. D. Hall. Available from NTIS, Springfield, Va. 22151, as PB-222 031, Price \$3.75 printed copy; \$1.45 microfiche. Environmental Protection Agency, National Environmental Research Center, Report EPA-670/2-73-044, July 1973. 39 p, 6 fig, 2 tab, 7 ref, append. EPA Program Element 1B2043.

Descriptors: *Aeration, *Waste water treatment, *Mathematical models, Costs, Computer programs, Sewage treatment, Activated sludge, *Cost comparisons.

Identifiers: *Post aeration techniques.

Design and cost estimating relationships are given for post aeration after the activated sludge process. Mechanical aerators in completely mixed rectangular basins, air diffusers mounted in the outlet channel for the plant, and air diffusers mounted in rectangular completely mixed concrete basins are considered. The costs of all three types of post aeration are given for 1-, 3-, 10-, 30-, and

100-mgd plants. The cost of the complete plant is compared with the cost of post aeration. (Knapp-USGS) W74-08045

DESIGN AND SIMULATION OF EQUALIZA-

DESIGN AND SIMULATION OF EQUALIZATION BASINS,
Environmental Protection Agency, Cincinnati,
Ohio. Office of Research and Development.
R. Smith, R. G. Eilers, and E. D. Hall.
Available from NTIS, Springfield, Va. 22151, as
PB-222 000, Price \$4.50 printed copy; \$1.45
microfiche. Environmental Protection Agency,
National Environment Research Center. Report National Environment Research Center, Report EPA-670/2-73-046, July 1973. 51 p, 5 fig, 6 tab, 12 ref, 4 append.

Descriptors: *Sewage treatment, Water level fluc-Descriptors: "Sewage treatment, water level fuc-tuations, "Equalizing reservoirs, "Waste water treatment, Costs, "Aeration, Oxygen demand, Mathematical models, Design, Computer models, Simulation analysis, "Construction costs. Identifiers: "Equalization basins.

Relationships for sizing equalization basins for smoothing the diurnal variation of dry weather flow into municipal wastewater treatment plants are given. The construction costs for rectangular concrete basins equipped with diffused air and for plastic lined earthen basins equipped with mechanical aerators are estimated. A time dependent digital computer model was developed for simulating biological activity and the consumption of oxygen in equalization basins in which the water level varies diurnally. (Knapp-USGS) W74-08046

COMMERCIAL DESALTING PLANT DATA AND ANALYSIS, VOLUMES I-VI, DSS Engineers, Inc., Ft. Lauderdale, Fla.

For primary bibliographic entry see Field 3A. W74-08061

NITROGEN REMOVAL MECHANISMS,

Agricultural Research Service, Phoenix, Ariz. Water Conservation Lab.

Journal Water Pollution Control Federation, Vol 44, No 7, p 1352-1361, July, 1972. 3 fig, 32 ref.

*Nutrient removal, *Nitrogen, Descriptors: Leaching, *Dentrification, Sewage treatment, Solid wastes, *Waste water treatment, Soil mechanics.

Nitrogen may be removed from a soil system in gaseous form by volatilization of ammonia or by denitrification. The amount of ammonia volatilized in a land disposal system is small, but large amounts of nitrogen could be removed during travel through a long stream or channel to the disposal area. Denitrification is perhaps the most desirable removal process because large amounts of nitrogen can be removed and transferred to the atmosphere as nitrogen gas. The nitrogen is thus completely removed from the system without causing air pollution. Additional research will be needed to determine whether denitrification can be sustained in a groundwater recharge system without prior oxidation of ammonium and/or additional sources of carbon. (Skogerboe-Colorado State) W74-08081

LEACHATE TREATMENT BY COAGULATION AND PRECIPITATION,

Camp, Dresser, and McKee, Boston, Mass. R. J. Thornton, and F. C. Blanc. Journal of the Environmental Engineering Division, American Society of Civil Engineers, Vol 99, No EE4, p 535-544, August, 1973. 2 fig, 5 tab, 9 Descriptors: *Landfills, *Sanitary engineering, *Leaching, Water quality, *Chemical precipitation, Environmental engineering, *Coagulation, Solid wastes, Waste water treatment.
Identifiers: *Chemical treatment.

When sanitary landfills are constructed with provisions for collection and treatment of leachates, chemical treatment may be one of the treatment processes employed. Research was conducted to determine the ability of chemical treatment to remove suspended solids, biochemical oxygen demand, chemical oxygen demand, iron, calcium, and magnesium from leachate. Chemical treatment studies were conducted in the laboratory using alum, lime, and ferric chloride. Preliminary results indicate that lime precipitation was most effective. Additional studies revealed that suspended solids, color, and some multivalent cations can be effectively removed from raw leachate using lime. However, significant removals of soluble biochemical oxygen demand were not observed and extremely high lime concentrations in the 300 mg/1 600 mg/1 range were required to obtain a relatively clear supernatant resulting in relatively large amounts of sludge. (Skogerboe-Colorado W74-08091

HEAD DROP ACROSS BAR SCREENS,

West Pakistan Univ. of Engineering and Technolo-

Journal Water Pollution Control Federation, Vol 44, No 7, p 1448-1452, July, 1972. 4 fig, 3 ref.

Descriptors: *Sewage treatment, *Treatment facilities, *Screens, *Head loss, Hydraulics, *Waste water treatment.

The head drop across screens used in sewage treatment plants is discussed. Various equations are presented along with their limitations. Appropriate times to use each equation are listed. A nomograph for use by plant operators is also developed. (Skogerboe-Colorado State) W74-08092

5E. Ultimate Disposal Of Wastes

USING SEWAGE EFFLUENT AND LIQUID DIGESTED SLUDGE TO ESTABLISH GRASSES AND LEGUMES ON BITUMINOUS STRIP-MINE SPOILS. Pennsylvania State Univ., University Park. School

of Forest Resources. For primary bibliographic entry see Field 5D. W74-07612

CARTMEN DEVISES TECHNIQUE DISPOSING OF 3.5 MILLION GALLONS OF LIQUID DISCARDS ANNUALLY. For primary bibliographic entry see Field 5D. W74-07762

SOLID FORMS FOR SAVANNAH RIVER PLANT HIGH-LEVEL WASTE, Du Pont de Nemours (E.I.) and Co., Aiken, S.C. Savannah River Plant. For primary bibliographic entry see Field 5D.

CHEMICAL ENGINEERING DIVISION, WASTE MANAGEMENT PROGRAMS, QUARTERLY REPORT, JULY-SEPTEMBER 1973,

Argonne National Lab., Ill. Chemical Engineering For primary bibliographic entry see Field 5D.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Water Quality Control—Group 5G

FINAL ENVIRONMENTAL STATEMENT RE-LATED TO THE PROPOSED PERRY NUCLEAR POWER PLANT, UNITS 1 AND 2.
Directorate of Licensing (AEC), Washington,

For primary bibliographic entry see Field 5A.

W74-07793

W74-08072

RECONNAISSANCE OF THE WATER RESOURCES IN THE VICINITY OF PROPOSED DEEP-WELL INJECTION SITES SOUTHEAST DADE COUNTY, FLORIDA, Geological Survey, Tallahassee, Fla. For primary bibliographic entry see Field 5B.

GEOHYDROLOGY OF THE BURIED TRIASSIC BASIN AT THE SAVANNAH RIVER PLANT, DuPont de Nemours(E.I) and Co., Aiken, S.C. Savannah River Lab. For primary bibliographic entry see Field 5B. W74-07934

HARBOR POLLUTION FROM LARGE SHIPS, Naval Undersea Center, San Diego, Calif. Dept. of Fleet Engineering. For primary bibliographic entry see Field 5B. W74-08006

INJECTION WELLS POSE A POTENTIAL THREAT. For primary bibliographic entry see Field 5B.

INFILTRATION AND LANDFILL BEHAVIOR. Waterloo Univ. (Ontario). For primary bibliographic entry see Field 5B.

5F. Water Treatment and **Quality Alteration**

WATER QUALITY AND TREATMENT OF DOMESTIC GROUNDWATER SUPPLIES, Illinois State Water Survey, Urbana. I. P. Gibb.

Circular 118, 1973. 17 p, 3 fig, 1 tab, 21 ref, 2 ap-

Descriptors: *Water treatment, *Groundwater, *Domestic water, *Illinois, Water wells, Water quality, Hydrogen sulfide, Potable water, Disinfection, Iron, Water softening, Methane. Identifiers: Iron removal.

Basic information is presented on water quality and treatment of domestic and farm groundwater supplies. Tests and practices that assure a safe sanitary water quality are described, and the common minerals and natural gases that are of concern to home water supplies in Illinois are discussed. Described are water treatment procedures and equipment for disinfection, iron removal, softening, methane and hydrogen sulfide gas removal, and their costs. (Knapp-USGS)

PLANNING A DOMESTIC GROUNDWATER SUPPLY SYSTEM, Illinois State Water Survey, Urbana For primary bibliographic entry see Field 4B. W74-07639

THE TREATMENT OF WASTE WATER FROM INDUSTRIES AND COMMERCE IN PUBLIC PURIFICATION PLANTS (IN GERMAN), Kantonales Amt fuer Gewasserschutz, Sankt Gal-Hen (Switzerland).
For primary bibliographic entry see Field 5D.
W74-07748

PROBLEMS FOR HYDROBIOLOGICAL IN-VESTIGATION UNDER CONDITIONS OF COMPLEX USE OF WATER RESOURCES (IN

Moscow State Univ. (USSR).

Moscow State Univ. (USSR).

M. M. Telichenko.
Gidrobiol Zh, Vol 8, No 3, p 5-13, 1972. 22 ref.
Identifiers: Eutrophication, *Germany,
Hydrobiological studies, Measures,
Plankton,
Sanitary conditions, *USSR, Water utilization,
*United States, *Self-purification, *Hydrobionts,
Wicket Foundament Water treatment.

Problems for the provision of sanitary and biologically pure water in the USSR, USA, East and West Germany are discussed. Studies in self-purification, the role of hydrobionts and their metabolites in the development of organoleptic qualities, the introduction of hydrobionts to promote self-purification and the use of plankton to control eutrophication and the use of plankton to control eutrophication are considered.--Copy-right 1973, Biological Abstracts, Inc. W74-07765

EXPERIMENTAL STUDY OF THE PROTECTIVE ABILITY OF WATER-TREATMENT PLANTS WITH RESPECT TO SOME SUBSTANCES OF CAPROLACTAM PRODUCTION Nauchno-Issledovatelskii Institut Moscow (USSR).

For primary bibliographic entry see Field 5D.

W74-07771

THE SEVERN SCHEME OF THE BRISTOL WATERWORKS COMPANY. Water and Water Engineering, Vol 77, No 933, p 431-432, November 1973.

Descriptors: *Water treatment, *Potable water, *Water supply, Water purification, Equipment, *Treatment facilities, Construction materials. Identifiers: *United Kingdom(Bristol).

The first phase works described herein augment the Bristol Waterworks Company's potable water supply by 24 mgd with provision in phase two for extension to supply a further 12 mgd, thus meeting predicted demands into the 1990's. The aim has been to provide buildings of a functional, industrial style with space to accommodate the additional requirements of the second phase extensions. (Sandoski-Franklin) W74-07772

DOMESTIC WATER SYSTEMS, NONCHEMI-CAL FACTORS IN CORROSION CONTROL, Olin Corp. Stamford, Conn. For primary bibliographic entry see Field 8G. W74-07849

DOMESTIC HOT WATER SYSTEMS, SILICATE TREATMENT INHIBITS CORROSION OF GALVANIZED STEEL AND COPPER AL-

LOYS, Illinois State Water Survey, Urbana. For primary bibliographic entry see Field 8G. W74-07850

WATER TREATMENT SYSTEM,

Carnegie-Mellon Univ., Pittsburgh, Pa. Dept. of Mechanical Engineering. F. M. Hagan, F. A. Rado, J. A. Rumancik, and A. Savinell. Savinell.

Report available from NTIS, Springfield, Va 22151, as PB-221 142, Price \$5.45 printed copy; \$1.45 microfiche. In: Special Topics—Human Powered Transit; Remote Medical Systems; Water Treatment: Carnegie-Mellon University Final Project Report, p 82-124, May 1973. 19 fig.

Descriptors: *Waste water treatment, *Water treatment, *Reverse osmosis, Costs, Equipment, *Water purification.

Identifiers: *Waterborne diseases.

A very inexpensive water treatment system which does not rely on a sophisticated power supply was designed and built using the principle of reverse osmosis. One of the main results expected is reduction of water borne disease. (Knapp-USGS) W74-07979

WATER TREATMENT MUD DECANTING TANK, J. V. T. Pool.

U.S. Patent No. 3,795,314, 3 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 920, No 1, p 95, March 5, 1974.

Descriptors: *Patents, *Mud, *Water treatment, *Water quality control, Lime, Equipment. Identifiers: *Decantation.

The mud decanting tank for water cold treatment with lime consists of a cylindrical tank having a tapered bottom. There is a concentric pipe housing a central vertical shaft driving a stirrer and a coaxi-al remover driven by means of a suitable prime mover. Manifolds or overflows are located at a determined level for drawing out the processed water. A second eccentric inner pipe also has a central vertical shaft that drives a stirrer and remover. The distribution of the inner piping provides a continuous recycling of the muds and chemicals. The muds are drawn out by suction from the bottom of the tank. (Sinha-OEIS) W74-08042

5G. Water Quality Control

PART I - A CONCEPTUAL MODEL FOR A TERRESTRIAL ECOSYSTEM PERTURBED WITH SEWAGE EFFLUENT, WITH SPECIAL WITH SEWAGE EFFLUENT, WITH SPECIAL REFERENCE TO THE MICHIGAN STATE UNIVERSITY WATER QUALITY MANAGE-MENT PROJECT; PART II - A PERSONALIZED BIBLIOGRAPHI C RETRIEVAL PACKAGE FOR RESOURCE SCIENTISTS,

Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife.

For primary bibliographic entry see Field 5D.

W74-07606

GROUNDWATER POLLUTION FEATURES OF FEDERAL AND STATE SATUTES AND REGU-

Geraghty and Miller, Port Washington, N.Y. F. van der Leeden.

Available Leeuen.

Available from the National Technical Information Service as PB-232 116, \$4.00 in paper copy, \$1.45 in microfiche. Environmental Protection Agency, Monitoring Series, Report No EPA-600/4-73-001a, July 1973, 88 p, 7 fig, 10 tab, 31 ref. EPA Contract 68-01-0759.

Descriptors: *Groundwater, *Water pollution con-Descriptors: "Groundwater, "Water pollution con-trol, "Legislation, "Regulation, State jurisdiction, Federal jurisdiction, Water law, Interstate Com-missions, Water needs, Recharge wells, Un-derground waste disposal, Water permits, Water quality, Waste water disposal, Waste disposal, Waste dumps, Landfills, Solid wastes, Sanitary engineering, Sealants, Monitoring, Aquifer management, Management.

Regulations and requirements are summarized of major public agencies with respect to groundwater pollution. A selective review was made of existing and pending legislation and regulations of Federal, State, and county governments and their agencies. Material was obtained both from central compilations and by direct contact with public agencies. State water laws, water-pollution laws, water-well regulations, and solid-waste regulations were examined; also, Federal laws dealing with pollution of Federal facilities, protecting against radiation and pesticides, and guidelines for waste-water

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G-Water Quality Control

treatment and solid-waste disposal facilities. Laws and regulations related to groundwater pollution vary widely as to objectives, scope, coverage, detail, and effectiveness. State water laws tend to deal primarily with protection of surface-water resources. Only 13 States were found to have water laws dealing in detail with measures to protect groundwater against pollution. However, numerous other laws and regulations affect groundwater pollution. A more extensive review of policies, rules, regulations, and procedures, with an evaluation of their effectiveness in controlling groundwater pollution, is recommended. (See also W74-07615) (EPA)

POLLUTED GROUNDWATER: SOME CAUSES, EFFECTS, CONTROLS, AND MONITORING. General Electric Co., Santa Barbara, Calif. Center for Advanced Studies. For primary bibliographic entry see Field 5B.

ACTIVE RESEARCH TASKS REPORT--FISCAL YEAR 1973.

National Environmental Research Center, Cincinnati, Ohio.

Available from NTIS, Springfield, Va. 22151 as PB-223 567; Price \$6.50 printed copy; \$1.45 microfiche. 1973, 367 p.

Descriptors: *Water pollution control, *Research and development, Laboratories, Research facilities, Projects, Grants. Identifiers: *Environmental protection agency.

Information is presented about the research programs conducted and supported by the National Environmental Research Center, Environmental Protection Agency, Cincinnati, during Fiscal Year 1973. The report is organized according to major research program elements, subdivided according to the Center's research objective achievement plans, and each research objective achievement plan is further subdivided into individual research tasks (or projects). The major theme of the Center's research activity is the development of technology and processes for the control of pollutants that degrade the air, water, and land environments. Programs that directly reflect this major theme include: the development of advanced methods for the treatment and control of municipal wastewater streams, in conjunction with the control of pollution resulting from storm and combined sewer overflows; the development of solutions to various specialized water pollution control problems such as oil and hazardous material spills, watercraft wastes, industrial wastes, mine drainage, and recreational wastes; the development or improvement of contaminant removal processes for the purification of the Nation's water supplies and recreational waters; the development of processes for environmentally acceptable treatment of toxic and hazardous solid waste materials; the development of resource recovery systems for the management of mu-nicipal and industrial solid waste; and the development of improved methods for the processing and disposal of these solid wastes. Complementary research programs are: the development, refine ment and promulgation of improved analytical methods for the measurement and determination of water quality; and the quantification and analysis of radioactive discharges. (Knapp-USGS)

THE CHEMICAL/PHYSICAL AND MICROBIOLOGICAL CHARACTERISTICS OF TYPICAL BATH AND LAUNDRY WASTE WATERS,

National Aeronautics and Space Administration, Langley Station, Va. Langley Research Center. For primary bibliographic entry see Field 5B. W74-07663 THE 7-DAY 10-YEAR LOW FLOWS OF IL-LINOIS STREAMS,

Illinois State Water Survey, Urbana. For primary bibliographic entry see Field 2E. W74-07677

USGS COMPLETES NATIONWIDE RECON-NAISSANCE OF METALS IN STREAMS. For primary bibliograps, ic entry see Field 5A. W74-07698

FEDERAL LAWS AND REGULATIONS,

S. S. Ross. Chemical Engineering/Deskbook Issue, Vol 79, No 10, p 9-12, May 8, 1972. 1 tab.

Descriptors: *Legislation, *Regulation, *Federal Water Pollution Control Act, *Water Quality Act, Air pollution, Water pollution, Public health, Taxes, Environmental effects, Economics, Law enforcement, Toxicity, Wastewater treatment. Identifiers: *National Environmental Policy Act(NEPA), Refuse act, Environmental protection agency.

Current water pollution legislation is presented, including 1976 best practicable' control technology as outlined by the Water Quality Act of 1965, 1970, 'best available' control technology, citizen suits, Refuse Act, National Environmental Policy Act, dredging and drilling and interim enforcement. Current EPA policy on Air Act enforcement is outlined, followed by a discussion of the Toxic Substances Control Act of 1972 and the proposed ocean dumping law, as well the impact of Safety and Health Act, pollution taxes and Noise Control Act on environmental policy. (Oleszkiewicz-Vanderbilt) W74-07703

INNOVATION: A CASE STUDY, American Society of Civil Engineers, New York. For primary bibliographic entry see Field 6B. W74-07720

STATE ORGANIZATION FOR WATER RESOURCES MANAGEMENT, Georgia Inst. of Tech., Atlanta. Environmental Resources Center. For primary bibliographic entry see Field 6E. W74-07733

CHARACTERIZATION OF SUSPENDED SEDI-MENTS IN WATER FROM SELECTED WATERSHEDS AS RELATED TO CONTROL PROCESSES, NUTRIENT CONTENTS, AND LAKE EUTROPHICATION, Washington State Univ., Pullman. Dept. of

Agronomy and Soils.
For primary bibliographic entry see Field 5B.
W74-07736

OXYGENATION OF AQUEOUS BODIES USING LIQUID OXYGEN-LOXINATION, Midwest Research Inst., Kansas City, Mo. For primary bibliographic entry see Field 5D. W74-07741

REGIONAL WATER AUTHORITIES: OR-GANIZATIONAL PATTERNS-PURPOSE OR PROFESSIONAL, G. Nunn, and R. Hattersley.

G. Nunn, and R. Hattersley. Water Pollution Control, Vol 72, No 8, p 675-692, 1973. 3 fig, 7 ref.

Descriptors: Administration, "Water Management(Applied), "Regional development, "Sewage districts, "Planning, "Organizations, Water districts, Regulation, Legislation, Water quality control.
Identifiers: "United Kingdom.

Since 1967 the need to establish single purpose regional authorities for administration of sewage purification services has been evidenced, affirmed, and reaffirmed. Considerable attention is given to the ultimate form the reorganization will take. stressing organizational patterns rather than detailed structures. The work of the regional water authorities is discussed function by function, the provisional pattern immediately after reorganization has been considered, and alternatives put forward based on professional grouping. The resultant recommendation is a functional pattern which should ensure that the regional water authorities are largely made up of interdisciplinary groups making their careers in departments having a clear functional purpose. (Sandoski-Franklin) W74-07754

CONTRIBUTION TO WATER POLLUTION FROM AGRICULTURAL AND URBAN SOURCES IN THE COACHELLA VALLEY, California Univ., Riverside. Dept. of Soil Science and Agricultural Engineering. For primary bibliographic entry see Field 5B. W74-07757

AUTOMATION OF THE CONTROL AND OPERATION OF WATER POLLUTION CONTROL WORKS,

Norwich Sewage Treatment Works (England). For primary bibliographic entry see Field 5D. W74-07758

PROBLEMS FOR HYDROBIOLOGICAL IN-VESTIGATION UNDER CONDITIONS OF COMPLEX USE OF WATER RESOURCES (IN RUSSIAN),

Moscow State Univ. (USSR). For primary bibliographic entry see Field 5F. W74-07765

EFFLUENT STANDARDS STRATEGY: REJU-VENATION OF AN OLD GAME PLAN, Cincinnati Univ. Ohio Coll of Medicine

Cincinnati Univ., Ohio. Coll. of Medicine. E. J. Cleary.

Journal Water Pollution Control Federation, Vol 46, No 1, p 9-17, January 1974. 11 ref.

Descriptors: *Effluents, Standards, *Water pollution control, Application methods, Environmental control, *Water quality standards, Legislation, *Federal government, *Regulation.

The events that have contributed to the new federal policy of placing primary reliance on uniform effluent standards for the achievement of clean water goals are traced. Merits and limitation associated with the two regulatory concepts are outlined and earlier applications of effluent standards practice by certain state and interstate regulatory agencies are cited. (Sandoski-Franklin) W74-07769

LEACHING REQUIREMENT STUDIES: SEN-SITIVITY OF ALFALFA TO SALINITY OF IR-RIGATION AND DRAINAGE WATERS, Agricultural Research Service, Riverside. Salinity Lab.

For primary bibliographic entry see Field 3C. W74-07774

ENVIRONMENTAL EFFECTS OF THE CONSTRUCTION AND OPERATION OF A GASE-OUS DIFFUSION PLANT. Goodyear Atomic Corp., Portsmouth, Ohio.

Goodyear Atomic Corp., Portsmouth, Ohio. For primary bibliographic entry see Field 5C. W74-07781

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Water Quality Control—Group 5G

DESIGN DATA AND SAFETY FEATURES OF COMMERCIAL NUCLEAR POWER PLANTS, VOL I

Oak Ridge National Lab., Tenn. Nuclear Safety Information Center. F. A. Heddleson.

F. A. Heddieson. Available from NTIS, Springfield, Va., as Rept. No. ORNL-NSIC-55, Vol. I; \$15.00 per copy, \$15.00 microfiche. Report No. ORNL-NSIC-55, Vol I, December 1973. 249 p, 33 fig., 1 glossary.

Descriptors: *Nuclear powerplants, *Design data, *Safety, *Hazards, *Radioactivity, *Sites, *Systems analysis, Rivers, Lakes, Oceans, Nuclear wastes, Radioactive wastes, Radioactive waste disposal, Effluents, Electric power, Ecology, Ecosystems, Environment, Monitoring, Construction, Operation.

Design data, safety features, and site characteristics are summarized for 32 commercial nuclear power plants in the United States. Six pages of data are presented for each plant consistng of thermal-hydraulic and nuclear factors, coning of thermal-hydraulic and nuclear factors, containment features, emergency core cooling systems, site features, circulating water system data, and miscellaneous factors. An aerial perspective is also presented for each plant. Plants described in this volume are Indian Point No. 1, Docket Number 50-3, and all subsequent plants finishing with Zion, Docket Number 50-295. A glossary of nuclear terms is provided. (See also W74-07795 and W74-07796) (Houser-ORNL) W74-07794 W74-07794

DESIGN DATA AND SAFETY FEATURES OF COMMERCIAL NUCLEAR POWER PLANTS, VOL. II.

Oak Ridge National Lab., Tenn. Nuclear Safety

Oak Ridge National Lab., Tenn. Nuclear Safety Information Center.

Available from NTIS, Springfield, Va., as Report No. ORNL-NSIC-55, Vol. II; \$15.00 per copy, \$15.00 microfiche. Report No ORNL-NSIC-55, Vol. II, January 1972. Compiled by F. A. Heddleson, 308 p., 48 fig, 1 glossary.

Descriptors: *Nuclear powerplants, *Design data, *Safety, *Hazards, *Radioactivity, *Sites, Radioisotopes, Systems analysis, Rivers, Lakes, Oceans, Streams, Nuclear wastes, Environment, Radioactive waste disposal, Effluents, Electric power, Ecology, Ecosystems, Monitoring, Construction, Operation.

Design data, safety features, and site characteristics are summarized for 47 commercial nuclear power plants in the United States. Six pages of data are presented for each plant consist-ing of thermal-hydraulic and nuclear factors, containment features, emergency core cooling systems, site features, circulating water system data, and miscellaneous factors. A small aerial perspective is also presented for each plant site. Plants described in this volume are Browns Ferry, Docket Number 50-296, and all subsequent plants finishing with Virgil C. Summer, Docket Number 50-395. A glossary of nuclear terms is provided. (See also W74-07794) (Houser-ORNL)

DESIGN DATA AND SAFETY FEATURES OF COMMERCIAL NUCLEAR POWER PLANTS, VOL. III,

Oak Ridge National Lab., Tenn. Nuclear Safety Information Center. F. A. Heddleson.

Available from NTIS, Springfield, Va., as ORNL-NSIC-55, Vol. III; \$15.00 per copy, \$15.00 microfiche. Report No ORNL-NSIC-55, Vol III, April 1974. 147 p, 18 fig, 1 glossary of terms.

Descriptors: *Nuclear powerplants, *Design data, *Safety, *Hazards, *Radioactivity, *Sites, Systems analysis, Rivers, Lakes, Oceans, Nuclear wastes, Radioactive waste disposal, Effluents, Electric power, Ecology, Ecosystems, Construction. Operations, Monitoring.

Design data, safety features, and site characteristics are summarized for 33 nuclear power units in 17 power stations in the United States. Six pages of data are presented for each plant consist-ing of thermal-hydraulic and nuclear factors, con-tainment features, emergency core cooling systems, site features, circulating water system data, and miscellaneous factors. An aerial perspective is also presented for each plant. Plants described in this volume are Hanford No. 2, Docket Number 50-397, and all subsequent plants finishing with Douglas Point, Docket Number 50-448, 50-449. A glossary of nuclear terms is pro-vided. (See also W74-07794) (Houser-ORNL) W74-07796

EFFECTS OF CHROME RADIATION EXPO-SURE ON MOSQUITOES (DIPTERA: CU-LICIDAE). 1. EFFECTS OF REARING IN SR-90

(CIDAE), I. EFFECTO VICTORS, 1-99 SOLUTIONS, tomic Energy of Canada Ltd., Pinawa fanitoba). Whiteshell Nuclear Research Establishment. For primary bibliographic entry see Field 5C.

THE EFFECTS OF RIVER FLUCTUATIONS RESULTING FROM HYDROELECTRIC PEAK-ING ON SELECTED AQUATIC INVERTEBRATES,

Idaho Univ., Moscow. Coll. of Forestry, Wildlife For primary bibliographic entry see Field 2I. W74-07830 and Range Sciences.

SOCIAL AND ECONOMIC FACTORS IN THE ADOPTION BY INDUSTRY OF WATER POL-LUTION CONTROL MEASURES IN MIN-

Minnesota Univ., St. Paul. Inst. of Agriculture. R. E. Rickson.

Available from the National Technical Informa-Available from the National Technical Informa-tion Service as PB-323 230, \$4.00 in paper copy, \$1.45 in microfiche. Minnesota Water Resources Research Center, St. Paul, Bulletin 67. February 1974. 67 p. 14 tab, 48 ref. OWRR B-047-MINN(2). 14-31-0001-3294.

Descriptors: *Water pollution control, *Social aspects, *Industrial wastes, *Waste disposal, *Minnesota, Regulation, Legal aspects, Model studies, Attitudes, Organizations, Water policy.

This study is an attempt to further understand the process by which industrial organizations change the way they dispose of waste. Substantively, the relationship of organizational characteristics to rates of change in waste procedures is of interest. A general model of change is envisioned. The two major forces creating change in industrial or-ganizations are the internal pressures within the organization that result from such factors as the complexity of its division of labor and production complexity of its division of labor and production technology, and the kinds of pressure the organization faces as the result of powerful and aggressive regulatory agencies and other groups. Finally, the nature of dependence the firm has upon water affects change. Overall, executives prefer that State and Federal governments establish policy while local governments enforce such policy. It is clearly in the interest of local business to have city and county officials be responsible for enforcement as business should be able to influence the judgement of these officials able to influence the judgement of these officials more so than representatives of state and Federal bureaus. Companies want regulatory policy to be consistent over time. Since policy developed at the local level can be overturned by State and Federal agencies, company preference for State and, espe-cially, Federal control in policy-formation is logically understandable. Companies will work so that their viewpoints will be represented in policy-forout water systems, sewer systems, tax rates and long-range planning about community water resources. (Walton-Minnesota) W74-07834

PROCESS CONTROL MODEL FOR OXYGEN PROCESS CONTROL MODEL FOR OXYGEN
REGENERATION OF POLLUTED RIVERS,
PHASES IV AND V, AND SPACIALLY AND
TEMPORALLY DISTRIBUTED DISCHARGE
OF EFFLUENTS IN ESTUARIES,
Rutgers The State Univ., New Brunswick, N.J.
Dept. of Chemical and Biochemical Engineers.
For primary bibliographic entry see Field 5B.
WYA 0732.

A SUMMARY OF QUANTITY, QUALITY AND ECONOMIC METHODOLOGY FOR ESTABLISHING MINIMUM FLOWS, Washington Univ., Seattle.
For primary bibliographic entry see Field 6B. W74-07847

PREVENTION OF CALCIUM CARBONATE SCALE DEPOSITION IN MILL WATER SYSTEMS, NL Industries, Inc., Houston, Tex. Baroid Div. For primary bibliographic entry see Field 8G.

GROUNDWATER ISSUE MERITS MORE FEDERAL PROTECTION, GROUNDWATER FEDERAL PROTECTION, GROUP POLLUTION AND CONSERVATION,

C. K. Lewicke. Environmental Science and Technology, Vol 6, No 3, p 213-215, March, 1972.

Descriptors: *Groundwater, *Wells, Artificial recharge, Waste injection wells, Pollution, Legislation, Government. Identifiers: *Water Pollution Control Act.

A general description is provided of the origin, transport, storage, and importance of ground-water. The dependency of much of the country, water. The dependency of much of the country especially rural areas, on their groundwater resources is emphasized. Artificial recharge is discussed. The contamination of groundwater by surface and subsurface disposal of wastes is examined, and concern for protection of this resource is urged. Federal and state regulation policies are examined. (Staplin-NWWA) W74-07854

WATER IMPURITIES EVALUATION OF METHODS FOR THEIR REMOVAL IN WATER MAINS (IN RUSSIAN), Kiev Research Inst. of General Communal Hygiene (USSR).
For primary bibliographic entry see Field 5D.

CORROSIVE EFFECTS OF SOUTHERN CALIFORNIA POTABLE WATERS. Southern California Metropolitan Water District, Los Angeles. For primary bibliographic entry see Field 8G.

MINE DRAINAGE POLLUTION CONTROL VIA REVERSE OSMOSIS, National Environmental Research Center, Rives, For primary bibliographic entry see Field 5D. W74-07881

CORROSION RESISTANCE OF PIPING AND CONSTRUCTION MATERIALS, Engelhard Industries, Inc., Newark, N.J. For primary bibliographic entry see Field 8G.

CORROSION BY WATERS, Union Carbide Corp., New York. For primary bibliographic entry see Field 8G. W74-07890

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G-Water Quality Control

ZINC/PHOSPHATE COMBINATIONS CON-TROL CORROSION IN POTABLE WATER DIS-

TRIBUTION SYSTEMS,
Virginia Chemicals, Inc., Portsmouth, Va.
For primary bibliographic entry see Field 8G.

PROCESSES, PROCEDURES, AND METHODS TO CONTROL POLLUTION FROM MINING

Skelly and Loy, Harrisburg, Pa. Available from Sup Doc, GPO, Washington, D.C. 20402 Price \$3.40. Environmental Protection Agency Publication 430/9-73-011, October 1973. 390 p, 215 ref. Contract 68-01-1830.

Descriptors: *Water pollution control, *Mine wastes, *Mine water, Coal mine wastes, Strip mine wastes, Acid mine water, Chemical wastes, Water pollution sources.

Pollution control technology applicable to mining activities (including new, currently operating, and abandoned surface and underground mines) is described. Information is provided on techniques of at-source water pollution control applicable to the mining industry. The manual is divided into three major components: (1) surface mining; (2) underground mining; and (3) treatment. The sections describing the various control methods are numbered sequentially through each major component to facilitate use of the manual. Pollution control techniques are described, evaluated, limitations and/or usefulness described, cost data for each technique detailed, where appropriate or possible, and special problems defined. (Knapp-USGS) W74-07927

METHODS AND PRACTICES FOR CONTROLLING WATER POLLUTION FROM AGRICULTURAL NONPOINT SOURCES. For primary bibliographic entry see Field 5B. W74-07941

PROCESSES, PROCEDURES, AND METHODS TO CONTROL POLLUTION RESULTING FROM ALL CONSTRUCTION ACTIVITY. Hittman Associates, Inc., Columbia, Md. For primary bibliographic entry see Field 5B.

ORGANO-MERCURY FUNGICIDE TREAT-MENT OF SUGAR-BEET SEED, Broom's Barn Experimental Station, Bury St. Edmunds (England).

For primary bibliographic entry see Field 5B. W74-07951

PETROLEUM SYSTEMS RELIABILITY ANAL-YSIS, A PROGRAM FOR PREVENTION OF OIL
SPILLS USING AN ENGINEERING APPROACH
TO A STUDY OF OFFSHORE AND ONSHORE CRUDE OIL PETROLEUM SYSTEMS, VOLUME II - APPENDICES, J. E. Ritchie, Jr., F. J. Allen, Jr., R. M. Feltes, R. Q. Foote, and W. A. Shortt.

Available from GPO Sup Doc as EPI.23/2:73-

280b, \$6.90; microfiche from NTIS as PB-232 343,

\$1.45. Environmental Protection Agency, Report EPA-R2-73-280b, August 1973, 433 p. EPA 15080 HOC. 68-01-0121.

Descriptors: Oil spills, *Oil pollution, Drill holes, *Water quality standards, Data collection, *Well data, *Pollution abatement, Water pollution con-Identifiers: *Oil spill records.

The analysis examined in detail the causes of polluting spills from selected petroleum systems (onshore and offshore crude oil drilling, production, and gathering/distribution systems). The study included the compilation of data from Federal, State and industrial spill reports, a field survey of the various types of facilities, and an analysis of spill-causing failures. EPA prevention regulations presently under consideration envision the preparation of prevention plans (called Spill Prevention, Control and Countermeasure Plans, or SPCC Plans) by facilities to prevent discharges of oil. This analysis should be invaluable in preparing and evaluating these plans. The results will in-dicate operating procedures and equipment which are still prone, and failures which can be anticipated and, in many cases, prevented. The application of preventive maintenance, operating effectively by the industry to successfully combat failures are discussed. Volume II contains eleven appendices that provide the detailed information upon which the findings are based. (See also W74-02947)(EPA) W74-07957

THE STATE OF THE SYSTEM (SOS) MODEL: MEASURING GROWTH LIMITATIONS USING

GEOLOGICAL CONCEPTS, Chase, Rosen and Wallace, Inc. Alexandria, Virginia For primary bibliographic entry see Field 6G.

W74-07958

CARBONATE BONDING OF TACONITE

Applied Technology Corp., Pittsburgh, Pa. P. J. LaRosa, K. A. Ricciardella, and R. J. McGarvey.

Copy Available from GPO Sup Doc as EP1.23:670/2-74-001, \$1.00; microfiche from NTIS as PB-232 370, \$1.45. Environmental Protection Available Agency, Technology Series Report EPA-670/2-74-001, January, 1974. 53 p. 22 fig. 12 tab. EPA Program Element 1BB040. 68-01-0195.

Descriptors: *Carbonates, *Bonding, *Road construction, Pollution abatement, Aggregates.
Identifiers: *Carbonate bonding, *Taconite tailings, Brickmaking.

Carbonate bonding consists of mixing and compacting a suitable material with water and lime hydrate, and then reacting it with a carbon dioxide-rich gas to form a coherent structure bonded by a matrix of calcite crystals. Carbonate bonding of mining refuse can minimize the pollution associated with refuse stockpiling and disposal. A laboratory study has indicated that taconite tailings can be carbonate bonded to form an effective road paving or brick-making material. In general, the compressive strength of carbonate bonded taconite tailings increased with increasing lime hydrate content, reaction time, and carbon dioxide concentration in the reaction gas. Air and water permeability, freeze-thaw resistance, and flexural strength of carbonate bonded taconite tailings were found to be comparable to concrete. Scaleup of the laboratory studies to demonstrate paving applications in small plots was hampered by a failure to obtain sufficient compaction. The results, however, did confirm the laboratory study findings. Possible applications of the carbonate bonding process utilizing taconite tailings are road building, formation of aggregate, and brickmaking. An approximate cost comparison suggests that the road construction application is an economical alternative to conventional road building materials and techniques. (EPA) W74-07959

POLLUTION CONTROL,

New Mexico State Univ., Las Cruces. Water Resources Research Inst. For primary bibliographic entry see Field 6D.

REGIONAL ENERGY-WATER PROBLEMS-COLORADO RIVER-GREAT BASIN.

Colorado State Univ., Fort Collins. Environmental Resources Center.
For primary bibliographic entry see Field 6D.

INDUSTRIAL LIQUID WASTE SURVEYS: TRAINING MANUAL.

Environmental Protection Agency, Cincinnati, Ohio. Water Quality Office. Available from the National Technical Informa-tion Service as PB-224 155, \$4.75 in paper copy, \$1.45 in microfiche. January 1973. 170 p. 37 fig, 23 tab, 116 ref

Descriptors: *Industrial wastes, *Surveys, *Liquid wastes, *Training, Methodology, Industrial water, Water pollution sources, Water utilization, Thermal pollution, Water temperature, Water pollution effects, Fish, Fish reproduction, Data collections, Effects, Water sampling, Analytical techniques, Waste identification, Chemical analysis, Bioassay, Hydrogen ion concentration, Acidity, Alkalinity, Electrical con-ductance, Chemical oxygen demand, Suspended Solids, Flow measurement, Fluorometry, Tracers, Documentation, Judicial decisions, Laboratory tests, Monitoring. Identifiers: *In-plant surveys.

The ability to detect potential or actual waste sources expedites all phases of industrial waste surveys, especially selection of sampling points. This ability is largely related to individual familiarity with industrial uses of water. Industry uses water for cooling and a number of process applications including reactant, reaction medium, solvent, cleaning or washing, rinsing, washing of equipment, quenching, scrubbing of gases, and as a transporting, processing, or heat transfer medi-um. This training manual is designed to facilitate the planning and conduct of in-plant industrial waste surveys and is divided into five outlines inwaste surveys and is divided into five outlines in-cluding industrial water use, sources of liquid wastes, and effects of different pollutants on aquatic life; survey planning, which discusses the factors to be considered in planning and the conduct of an in-plant survey; analytical procedures outline the physical and chemical properties and bioassay techniques; survey methods in which procedures for sampling and measuring flows are outlined; survey evaluation and reporting survey results, and pertinent features concerning court proceedings dealing with water quality evidence. (Auen-Wisconsin)

RESEARCH TO DETERMINE THE ENVIRON-MENTAL RESPONSE TO THE DEPOSITION OF SPOIL ON SALT MARSHES USING DIKED AND UNDIKED TECHNIQUES. Skidaway Inst. of Oceanography, Savannah, Ga. For primary bibliographic entry see Field 6G W74-07990

ENVIRONMENTAL FACTORS OF LEUKEMIA MORBIDITY, (IN POLISH), For primary bibliographic entry see Field 5C. W74-07999

EFFECTS OF COLORADO RIVER WATER QUALITY AND SUPPLY ON IRRIGATED AGRICULTURE, Economic Research Service, Davis, Calif. For primary bibliographic entry see Field 3C. W74-08014

INDUSTRIAL APPLICATION OF WHITFORD'S DEMAND FORECASTING PROCEDURE Southern Methodist Univ., Dallas, Tex. Inst. of For primary bibliographic entry see Field 6D. W74-08015

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Water Quality Control—Group 5G

MULTI-UNIT APPARATUS FOR COLLECTING OIL FROM THE SURFACE OF A BODY OF WATER, W. H. Daniel.

U.S. Patent No. 3,784,013, 4 p, 8 fig, 1 ref; Official Gazette of the United States Patent Office, Vol 918, No 2, p 680, January 8, 1974.

Descriptors: *Patents, *Oil pollution, *Pollution abatement, *Water quality control, *Water pollu-tion control, Equipment, Water pollution, Separation techniques.

Oil is collected from the surface of the water regardless of the contour or wave motion of the water, not by moving the oil in a horizontal direction relative to the water but rather by moving the oil downward beneath the surface of the water, and then upward. Having regard for the differential specific gravities of oil and water, the downward movement of the oil beneath the surface of the water imparts to the oil the ability to perform the work of raising the separated oil a substantial distance above the surface of the water. A tent-like structure is immersed from a position above the surface of the water to a position below the surface thereby confining and forc-ing downward an area of the oil. The oil moves to the top of the tent-like structure and the oil thus concentrated is permitted to flow into the lower portion of a vertical conduit, in which it tends to flow upward under hydrostatic pressure. The tentlike structure is repeatedly raised and lowered, thereby repeatedly introducing oil into the conduit, so that the liquid in the conduit rises to a height above the surface of the surrounding water. Oil flowing from the conduit is collected and maintained separate from the body of water. (Sinha -OFIS) W74-08020

FLOATING BARRIER.

Chevron Research Co., San Francisco, Calif. (Assignee). J. A. Sayles.

U.S. Patent No 3,792,589, 6 p, 7 fig, 5 ref; Official Gazette of the United States Patent Office, Vol 919, No 3, p 819, February 19, 1974.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Pollution abatement, Water quality control, Water pollution control, Equipment, *Barriers, *Flotsam.

The boom which serves as a floating barrier is constructed of a single sheet of reinforced rubber-like material which is folded along a longitudinal median to form the sides of it. A tensile stress cable, stress plates, ballast weights, and, in one modifica-tion, stiffening members and end plates, are placed between the two sides of the boom in appropriate operating relationship and the sides are then joined together. A series of relatively short inflatable chambers are formed along the top edge of the boom. Opposite sides of the boom are vul-canized together between flotation chambers to form the chambers as separate air pockets. This construction gives the boom a degree of stiffness in a lateral direction from the top edge to the bottom edge which will function to hold the top edge of the boom above the surface of the water. (Sinha-OEIS) W74-08025

METHOD AND APPARATUS FOR AERATING BODIES OF WATER,

B. E. Hirshon. U. S. Patent No 3,794,303, 8 p, 17 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 919, No 4, p 1251, February 26, 1974.

Descriptors: *Patents, *Aeration, *Aerators, Waste water treatment, *Pollution abatement, *Water pollution control, *Water quality control, Equipment, Effluents.

Unbalanced water columns which are connected at their upper ends are used provide continuous aeration of water at any desired depth. The head on one column is attained by the introduction of air into the other columns which serves both to raise and to aerate the water. Alternately, the water may be circulated by mechanical means and the air introduced at the top of its travel. Undis-solved air is permitted to escape as it passes between the columns before it enters the return column. (Sinha-OEIS) W74-08031

OIL RECOVERY APPARATUS,

U. S. Patent No 3,794,175, 5 p, 4 fig, 8 ref; Official Gazette of the United States Patent Office, Vol. 919, No. 4, p. 1217, February 26, 1974.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Pollution abatement, Water quality control, *Water pollution control, Equipment, *Separation

An oil recovery vessel is provided with a receiving chamber having an upstanding side wall high enough to prevent excessive flooding during use in moderately heavy seas. Floating oil is picked up by water jets and carried over the wall into the receiving chamber. The nozzle of each jet is supported by a float operated mechanism adapted to automatically maintain it in a proper discharge attitude with respect to the side wall. The receiving chamber consists of two compartments, both open at their lower ends. During operation a column of recovered oil builds up in the annular outer chamber. As the colum increases in depth its lower level drops until eventually the oil is in communication with aperatures in the sidewall. The oil passes through the aperatures into the inner compartments and rises. An oil pickup pipe draws the oil to a collection receptacle. (Sinha-OEIS)

CONTROL OF WATERBORNE OIL SLICKS.

P. Preus.

U. S. Patent No 3,795,315, 3 p, 6 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 920, No 1, p 96, March 5, 1974.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Pollution abatement, Water pollution control, Water quality control, Equipment, *Barriers.

A segmented floating barrier having a fluid previous skirt is placed to contain an oil slick. An oleophilic-hydrophobic fiberous substance is used to absorb the oil and render it incapable of passing through the skirt. A bottom hem is formed along the lower margin of the skirt and is filled with a heavy material to provide ballast. The skirt is formed of an open mesh fabric reinforced sand-wich of sheet plastic. (Sinha-OEIS) W74-08036

OSMOSIS-NEUTRALIZATION REVERSE PROCESS FOR TREATING MINERAL CONTAMINATED WATERS, Environmental Protection Agency, Washington,

D.C. (assignee)

For primary bibliographic entry see Field 5D. W74-08041

PRESENT PROBLEMS IN THE STUDY OF SUR-FACE-WATER QUALITY (AKTUAL'NYYE PROBLEMY ISSLEDOVANIYA KACHESTVA POVERKHNOSTNYKH VOD), Gosudarstvennyi Gidrologicheskii Institut, Lenin-

grad (USSR).

A. V. Karaushev, and B. G. Skakal'skiy. Meteorologiya i Gidrologiya, No 10, p 73-81, October 1973. 25 ref. Descriptors: *Water quality, *Water chemistry, *Water pollution control, *Human population, *Surface water, Lakes, Reservoirs, Rivers, Waste water(Pollution), Hydrodynamics, Hydrologic aspects. Identifiers: *USSR.

The present state of research on quality characteristics of surface waters in the USSR and on evaluation of changes in water quality in rivers, lakes, and water bodies as a result of human activity is reviewed. Attention is focused on problems arising in connection with the need to regulate water quality and to control pollution. Problems relating to development of methods of calculating changes in water quality as a function of waste water inflow and of hydrodynamic and hydrologic conditions are discussed. (Josefson-USGS) W74-08050

SANITARY-HYGIENIC EVALUATION OF THE WATER QUALITY OF THE NURA WATER CONDUIT OF THE TSELINOGRAD DISTRICT (IN RUSSIAN), Meditsinskii Institut, Tselinograd (USSR).

For primary bibliographic entry see Field 5A.

PROBLEM OF RATIONAL USE AND CONSERVATION OF WATER RESOURCES AND GOALS OF HYDROLOGY (PROBLEMA RAT-SIONAL'NOGO ISPOL'ZOVANIYA I OK-HRANY VODNYKH RESURSOV I ZADACHI GIDROLOGII),
Hydrometeorological Service of the USSR,

Moscow.

For primary bibliographic entry see Field 6B. W74-08055

QUALITY OF DRINKING WATER ON SHIPS IN RELATION TO SAILING CONDITIONS, (IN RUSSIAN),

Black Sea-Azov Watershed Basin Sanitary Epidemiology Station, Odessa (USSR). For primary bibliographic entry see Field 5B. W74-08082

DESTRUCTION TRIALS OF THE MUSKRAT. ONDATRA ZIBETHICA L., IN PONDS USING POISONING RAFTS, (IN FRENCH), Laboratoire des Petits Vertebres, Jouy-en-Josas

J-P. Vincent, and J-P. Quere. Ann Zool Ecol Anim. Vol 5, No 1, p 119-127, 1973. Illus. (English summary).

Identifiers: *Chlorophacinone, Destruction trials, *France(Loir-et-Cher department), *Muskrat, On-datra-Zibethicus, Pesticides, *Poisoning rafts,

Two muskrat destruction trials using poisoning rafts in ponds in the Loir-et-Cher department (France) were performed. The practical efficiency of this measure was computed. Intake was measured before and after treatment using unpoisoned bait. The original population level was estimated using Lincoln's Index method. Muskrats were captured in traps and labeled by partial shearing of the fur. Labeled animals found among the dead along the shores of the pond and in final trapping were then counted. Various types of activity such as frequentation of different burrows and water surface activity at night were observed. Poisoning was done with carrots cut in rounds and coated with a 0.25% oily solution of chlorophacinone. The dose was 20 cm3/kg of bait, or 0.005% active matter. The results obtained by these different methods agree, and practical efficiency may be estimated at more than 90%. This method seems to offer complete guarantee that secondary poisoning of game does not occur.—Copyright 1973, Biological Abstracts, Inc. W74-08128

Field 5-WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G-Water Quality Control

POLLUTION CONTROL AND ERECTION OF SEWAGE PLANTS: TECHNICAL FEASIBLI-TIES, FUTURE DEMANDS, (IN GERMAN), Hygiene-Institut, Muenster (West Germany). H Benloh

Zentralbl Bakteriol Parasitenkd Infektionskr Hyg Erste Abt Orig Reihe B Hyg Praev Med. Vol 155, No 3, p 237-247. 1971. Illus. English summary. Identifiers: Pathogenic organisms, Sewage, *Potable water, *Water pollution control, Treatment facilities, *Water supply, *Feasibility studies.

Problems of water supply and consumption are discussed. The esthetic significance of lakes and rivers and the significance of waters as economic bases of agriculture and certain types of industry and fisheries are surpassed by the importance of the drinking water supply. The water supply is based directly or indirectly on recharge. For reasons of hygiene, efforts to purify lake and river water should not lead to reducing the consumption of drinking water. The quality of drinking water and water used for industrial purposes may be improved by employing expensive conditioning methods. Water purification restricted to the killing of pathogenic organisms is not appropriate. The high water consumption in certain ages of life (e.g., infancy) requires particularly cautious disposal of biocidal, pesticidal and carcinogenic substances. Scientific methods for detecting toxic substances contained in the drinking water need elaboration. Legal aspects are considered,—Copyright 1973, Biological Abstracts, Inc. W74-08138

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

THE METHODOLOGY OF BAYESIAN INFERENCE AND DECISION MAKING APPLIED TO EXTREME HYDROLOGIC EVENTS, Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering. For primary bibliographic entry see Field 2A. W74-07601

THE ROLE OF PUBLIC INVOLVEMENT IN WATER RESOURCES PLANNING AND DEVELOPMENT, A REPORT WITH READINGS ON RESEARCH AND EXPERIMENTATION IN PUBLIC AFFAIRS EDUCATION.

Cornell Univ., Ithaca, N.Y. Water Resources and

Cornell Univ., Ithaca, N.Y. Water Resources an Marine Sciences Center.

For primary bibliographic entry see Field 6B.

ECONOMIC OPTIMIZATION AND SIMULA-TION TECHNIQUES FOR MANAGEMENT OF REGIONAL WATER RESOURCE SYSTEMS, Texas Water Development Board Austin

Texas Water Development Board, Austin. Available from the National Technical Information Service as PB-232 066; \$3.75 in paper copy, \$1.45 in microfiche. Completion Report 179, February 1974. 51 p, 31 fig, 7 tab, 27 ref. OWRR C-2070(3360)(2). 14-31-0001-3360.

Descriptors: *Water requirements, *Irrigation systems, *Water allocation, Water resources development, *Optimum development plans, Model studies, Stochastic hydrology, *Economic efficiency, Water quality, Systems analysis, Networks, *Simulation analysis, Optimization, Linear programming, Sampling, Dynamic programming, Texas, Management, *Regional analysis. Identifiers: *Texas water plan, Irrigated agricul-

This research represents the final phase of a threephase research project leading towards the development of a computer-oriented planning system for use in planning large, multibasin systems of reservoirs and connecting river reaches and pump-canals. Specifically, the research defines a methodology for finding an optimal size, operation, and staging of construction of a water resource system with highly variable inflows and demands that are increasing over the planning horizon and assessing the impacts of such a system. The methodology is developed using the Texas Water System as an example. Primarily through the development of a model which simulates the demand for and use of water in an agriculturally oriented area, the third phase of the research builds on progress previously achieved in simulating and optimizing the water capture and transfer system. This model simulates the farmer's rational decision process in maximizing his monetary returns in the face of highly variable hydrology and various physical and institutional restrictions. In effect, this model sizes the agricultural water demand to the available water supply. Additionally, the research presented includes enhancements to the supply simulation models as well as the development of a model to simulate the quality of water in a multibasin system. The computer programs developed during this research designed to analyze a problem on a monthly basis using historic or stochastic hydrologic input data sequences, a specified demand build-up period, and an economic life as defined by the user.

ANALYTICAL TECHNIQUES FOR PLANNING COMPLEX WATER RESOURCE SYSTEMS.
Texas Water Development Board, Austin.

Texas Water Development Board, Austin. Systems Engineering Div.

Available from the National Technical Information Service as PR-232 158, \$3.75, in paper conv.

Available from the National Technical Information Service as PB-232 158, \$3.75, in paper copy, \$1.45 in microfiche. Report No 183, April 1974, 59 p, 34 fig, 2 tab, 13 ref. OWRR C-2070(3360)(3).

Descriptors: *Water resources, *Planning, *Systems engineering, Water supply, Water quality, River basin development, Optimization, Stochastic hydrology, *Systems analysis, Economic analysis, Systems models, Operations research, Analytical techniques, Texas. Identifiers: *Texas Water Plan.

This report summarizes the research experience of the Texas Water Development Board, the constitutional water planning and development agency for the State of Texas, over the period 1965-1972. In this period, the Board initiated and conducted a sustained program of research, supported by the cooperation and financial aid of the Office of Water Resources Research, that has developed techniques useful in decision-making which are believed to be generally applicable to water planning problems elsewhere. The Texas Water Plan, formally adopted and released in 1968, relied upon traditional analytical and planning techniques. This planning effort clearly demonstrated that planning to solve current and future water problems on a statewide basis required new techniques of analysis that would not have been possible, except in a conceptual sense, before the advent of high-speed, large-capacity computers. Therefore, systems analysis techniques were developed to assist in solving some of the longrange water planning problems encountered and identified in the Texas Water Plan and for refining the Texas Water Plan as it was originally conceived. In this report, the conditions dictating the constraints and opportunities of the Texas Water Plan are described. The sequential steps in the research program are outlined, and the proposed facilities of the Texas Water System are used as an example for research and development of new planning techniques. W74-07722

WATER RESOURCES MANAGEMENT FOR METROPOLITAN WASHINGTON: ANALYSIS OF THE JOINT INTERACTIONS OF WATER AND SEWAGE SERVICE, PUBLIC POLICY AND LAND DEVELOPMENT PATTERNS IN AN EXPANDING METROPOLITAN AREA. Metropolitan Washington Council of Governments, D.C. For primary bibliographic entry see Field 6B. W74-07723

APPENDICES TO WATER RESOURCES MANAGEMENT FOR METROPOLITAN WASHINGTON: ANALYSIS OF THE JOINT INTERACTIONS OF WATER AND SEWAGE SERVICE, PUBLIC POLICY, AND LAND DEVELOPMENT PATTERNS IN AN EXPANDING METROPOLITAN AREA.

Metropolitan Washington Council of Governments, D.C.
For primary bibliographic entry see Field 6B. W74-07724

THE STATE OF THE SYSTEM (SOS) MODEL: MEASURING GROWTH LIMITATIONS USING GEOLOGICAL CONCEPTS, Chase, Rosen and Wallace, Inc. Alexandria, Virginia.

ginia For primary bibliographic entry see Field 6G. W74-07958

OPTIMAL TIMING AND SIZING OF A CON-JUNCTIVE URBAN WATER SUPPLY AND WASTE WATER SYSTEM WITH NONLINEAR PROGRAMMING, Loval Plair Loy Appeles Calif

Loyola Univ., Los Angeles, Calif. For primary bibliographic entry see Field 5D. W74-08010

A SYSTEMS APPROACH TO ASSESSMENT OF RURAL WATER SUPPLY PROGRAM EFFECTIVENESS.

Asian Inst. of Tech., Bangkok (Thailand). Dept. of Environmental Engineering.
For primary bibliographic entry see Field 6B. W74-08012

IMPROVED DYNAMIC PROGRAMING PROCEDURES AND THEIR PRACTICAL AP-PLICATION TO WATER RESOURCE SYSTEMS.

Water Research Association, Marlow (England). P. A. Mawer, and D. Thorn. Water Resources Research, Vol 10, No 2, p 183-

Water Resources Research, Vol 10, No 2, p 183 190, April 1974. 9 fig, 2 tab, 10 ref.

Descriptors: Water resources development, *Dynamic programming, *Simulation analysis, *Reservoirs, *Long-term planning, *Operation, Optimization, Algorithms, Probability, Markov processes, Reliability, Water demand, Water supply, Pumping plants, Inflow, Rivers, Decision making, Operations research, Mathematical models.

Identifiers: *Cost minimization, Value iteration, Penalty costs, Policy making, Transition costs, Computational procedures.

An optimization algorithm is described that uses value iteration dynamic programming and simulation in conjunction with penalty costs to derive long-term operating policies for water resource systems. Feedback from the simulation to the dynamic programming is achieved by means of the penalty costs, which may be interpreted as Lagrangian multipliers. Highly efficient value iteration procedures are developed for two types of problems illustrated by numerical examples: (1) deterministic transition costs--an on-channel reservoir is to be operated in conjunction with a high cost source; and (2) probability transition costs--herein considers the supply of water to a pumped storage reservoir used for amenity purposes and direct regulated water demands. Both problems require finding an operating policy that minimizes long-term running costs and satisfies a reliability objective; the latter problem requires

WATER RESOURCES PLANNING—Field 6

Evaluation Process—Group 6B

also fulfilling an amenity objective. An indication is given of how the methods described can be applied to multireservoir systems by using the con-cept of an equivalent reservoir. It is shown that simplified dynamic programming procedures can be formulated by recognizing the inherent nature of the problem and neglecting such things as the serial correlation of reservoir inputs. These procedures produce substantial savings in computation, enabling a much more thorough appraisal of problems than was hitherto possible. Although slightly suboptimal operating policies are ob-tained, the practical benefits obtained from the general optimization algorithm outweigh most theoretical objections. (Bell-Cornell) W74-08013

INDUCED SAFETY ALGORITHM FOR HYDROLOGIC DESIGN UNDER UNCERTAIN-

Water Resources Center, Budapest (Hungary). I. Bogardi, and F. Szidarovszky. Water Resources Research, Vol 10, No 2, p 155-161, April 1974. 5 fig, 3 tab, 12 ref, 2 appen.

Descriptors: *Design, Hydrology, *Structures, Cost-benefit analysis, *Algorithms, *Simulation analysis, *Levees, Rivers, Equations, Optimization, Decision making, Construction costs, Statistical methods, Regulation, Mathematical models, Systems analysis, *Risks.

Identifiers: *Hungary(Tisza River),
*Hungary(Lajta River), Finite sample size, Margin of safety, Economic loss.

The induced safety algorithm (ISA) is a method for calculating the margin of safety in the design of hydrologic structures under the uncertainty due to finite sample size. The ISA may be applied to the design of a new structure or the redesign of an existing one; the initial design criterion may be calculated by benefit-cost or be prescribed by regula-tion. The optimum decision is reached by maximizing the sum of three terms (in case of redesign to a larger value): the discounted economic benefit due to uncertainty reduction, the average loss averted, and the incremental construction cost. The uncertainty on the distribution function of the state variable (yearly peak flow) is encoded by the probability density function of flow pertaining to a fixed return period. Simulation is used to calculate the distribution of the state variable. Two examples of levee design in Hungary illustrate the method. (Bell-Cornell) W74-08017

EARTHOUAKE DAMAGE COSTS IN THE DESIGN OF WATER RESOURCE SYSTEMS, California Univ., Los Angeles. Dept. of Engineering Systems. For primary bibliographic entry see Field 4A. W74-08018

6B. Evaluation Process

SUMMARY REPORT FOR A METHODOLOGY STUDY TO DEVELOP EVALUATION CRITERIA FOR WILD AND SCENIC RIVERS, Idaho Univ., Moscow. Dept. of Agricultural **Economics**

E. L. Michalson, and J. Hamilton.

B. L. Michalson, and J. Hamilton.
Available from the National Technical Informa-tion Service as PB-232 070, \$5.75 in paper copy, \$1.45 in microfiche. Completion Report, Idaho Water Resources Research Institute, Moscow, Scenic River Study Report no 10, December 1973. 181 p, 12 fig, 2 tab, 22 ref. OWRR B-014-IDA(16). 14-31-001-3074.

Descriptors: *Methodology, *Cost-benefit ratio, *Evaluation, Water resource development, Hydroelectric power, Irrigation, Agriculture, Archaeology, Commercial fisheries, Flood con-trol, Natural resources, History, Hunting, Naviga-

tion, Recreation demand, Water supply, Water quality control, *Idaho, Recreation facilities. Identifiers: *Salmon River(Idaho), *Wild Rivers, Hydroelectric power.

The general objective was to develop a methodology to evaluate selected rivers to determine if they should be included in the National Wild and Scenic Rivers System as defined in the Wild and Scenic Rivers Act (PL 90-542). Included in the development of the methodology was inventorying resources and resource areas important to wild river states, and evaluating each of these areas in light of river classification. The evaluation process followed the procedures set forth in the Water Resources Council's 'Establishment of Principles and Standards for Planning Water and Related Land Resources' using the alternate cost approach towards establishment of resource values. This approach involves the concept of consumer surplus used to establish net values for alternative resources uses in the Salmon River Basin. These consumer surplus values were then compared to determine which of them provided the largest net benefits. The two competing resource uses identified were hydroelectric power production methodology determined the trade-offs between outdoor recreation and hydroelectric power production of the Salmon River. The methodology recognizes that the ultimate decision to preserve a wild and scenic river rests largely on a political value judgement. The procedure described permits one to quantify in terms of net benefits measured as consumer surplus values the trade-offs between competing resource uses. W74-07608

AN ANALYTICAL INTERDISCIPLINARY EVALUATION OF THE UTILIZATION OF THE WATER RESOURCES OF THE RIO GRANDE IN NEW MEXICO: LOWER RIO GRANDE RE-

GION, New Mexico State Univ., Las Cruces. Dept. of Agricultural Economics. R. R. Lansford, S. Ben-David, T. G. Gebhard, Jr.

W. Brutsaert, and B. J. Creel.

Available from the National Technical Informa-tion Service as PB-232 068, \$4.50 in paper copy, \$1.45 in microfiche. New Mexico Water Resource Research Institute, Las Cruces, Report No 024, May 1974, 109 p, 16 fig, 34 tab, 87 ref. OWRR A-045-NMEX(5) and B-016-NMEX(6). B-019-NMEX(6) and B-026-NMEX(6).

Descriptors: *New Mexico, *Water demand, Economics, *Water resources development, Management, *Economic predictions, *Surfacegroundwater relationships, Natural resources, Water requirements, Resource allocation, River basins, Groundwater management, Water law, Interstate compacts, International compacts, Treaties, Litigation, Water quality, Water utilization, Human population, Employment, Industrial water, Recreation, *Rio Grande River.

Identifiers: *Socio-economic model, Interdisciplinary, Groundwater appropriations, Input-output coefficient, Irrigation water diversions.

An interdisciplinary approach to the solution of the water resource problems of the Lower Rio Grande Region in New Mexico was centered around a socio-economic model, with special emphasis placed upon the Rio Grande Region. Inputs into the socio-economic model were obtained from separate studies. Three sets of alternatives were considered: (1) Without a water constraint, in the Rio Grande Region, both production and depletions are expected to exhibit the largest increase (59.7 percent and 47.4 percent, respectively); (2) When a surface water constraint is imposed, the value of production is reduced by \$18.1 million in 2020 and water depletions are expected to decrease about 18.1 percent by 2020; (3) When a total water constraint is imposed, the value of production is decreased \$4.1 million below that expected when using only a surface water constraint,

and water depletions reduced about 8.4 percent. The Lower Rio Grande Region is expected to follow the general trend of the total Rio Grande Region but at a higher growth rate. The expected in-crease in total value of production from 1970 to 2020 is 62.0 percent, employment 63.5 percent, and water depletions about 61 percent. When a surface-water constraint is imposed, production is expected to be reduced \$13.6 million in 2020, empleyment by 154 employees, and water depletions by 61,404 acre-feet. When an additional constraint is imposed on ground water in the LRGR, production would be decreased \$0.4 million in 2020, employment by an additional 15 employees, and water depletions by 5,764 acre-feet. (Hain-New Mexico State) W74-07609

THE ROLE OF PUBLIC INVOLVEMENT IN WATER RESOURCES PLANNING AND DEVELOPMENT, A REPORT WITH READINGS ON RESEARCH AND EXPERIMENTATION IN PUBLIC AFFAIRS EDUCATION.
Cornell Univ., Ithaca, N.Y. Water Resources and

Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.

Available from the National Technical Information Service as PB-232 079, \$5.00 in paper copy, \$1.45 in microfiche. Technical Completion Report No 79, A.E. Ext 74-3, Cornell University Water Resources and Marine Sciences Center, Ithaca, New York, March 1974. 160 p, 47 ref. (Assembled and edited David J. Allee). OWRR B-017-NY(1).

Descriptors: *Water resources development, *Planning, *Education, *Research, *River basins, *Projects, *New York, *Evaluation, Methodology, Management, Lakes, Watersheds, Political aspects, Social aspects, Systems analysis. Identifiers: *Public involvement.

Considered is the use of educational techniques to encourage wider and more informed participation in the public aspects of water resources. This report grows out of experimental educational work at the Cornell University Water Resources and Marine Sciences Center between July 1969 and June 1971, discloses objectives, procedures, and details of this research, and consolidates some experience and analysis in the use of such techniques for improving planning and development for improving planning and development processes in the water resources field. The Cornell Project stressed the exploration of methods, principles, roles and opportunities for the participation of universities in providing educational inputs into public involvement in water resources planning and development. Alternative techniques were evaluated and a variety of activities were un-dertaken in a variety of settings; in every case, comprehensive basin planning was actively being pursued under either state or federal leadership. Evaluation procedures included: systematic application of professional judgment as each program succeeded; and regular contact and interaction with a variety of social scientists. Numerous pro-jects are identified and discussed as to objective, situation, activities, and results. (Bell-Cornell)
W74-07610

CAPACITY OF WATER-BASED RECREATION SYSTEMS PART I: THE STATE OF THE ART -A LITERATURE REVIEW, North Carolina State Univ., Raleigh. Dept. of Recreation Resources Administration.

Recreation Resources Administration.

G. A. Hammon, H. K. Cordell, L. W. Moncrief,
M. R. Warren, and R. A. Crysdale.

Available from the National Technical Information Service as PB-232 092; \$3.75 in paper copy,
\$1.45 in microfiche. North Carolina Water Resources Research Institute, Raleigh, Report No 90, (UNC-WRRI-74-90), April 1974. 49 p, 147 ref. OWRR B-013-NC(3). 14-01-0001-1936.

Descriptors: *Recreation, Boating, Swimming, Water skiing, Fishing, *Recreation facilities, Planning, *Bibliographies, *Reviews, Water Planning, *Bibliographies, *Reviews, Water sports, Methodology, Measurement, Attitudes,

Field 6-WATER RESOURCES PLANNING

Group 6B-Evaluation Process

Identifiers: *Recreation capacity.

Recreation capacity is a popular concept, but there is no established rationale or methodology for understanding, measuring, and applying it. This re-port recognizes the complex and dynamic nature of capacity by reviewing separately the literature which bears on each of five categories of factors which influence capacity: (1) administrative, (2) biological, (3) physical, (4) social, and (5) temporal. The literature is dominated by published reports dealing primarily with the physical factors and secondarily with the social factors. Administrative, biological, and temporal factors have received minor attention in the literature. The ap-plicability of Liebig's law of the minimum (the occurrence and functioning of an organism is limited by that essential environmental factor, or com-bination of factors, which is present to the least favorable extent) to the concept of capacity is discussed. The final section reviews the empirical research effort which has been applied to capacity conceptualization and measurement. To date, this effort has been meager and fragmented. (McJunkin-North Carolina State) W74-07719

INNOVATION: A CASE STUDY. American Society of Civil Engineers, New York. M. B. McPherson.

Available from the National Technical Informa-Available from the National Technical Informa-tion Service as PB-232 166; \$3.75 in paper copy, \$1.45 in microfiche. ASCE Urban Water Resources Research Program, Technical Memorandum No 21, February, 1974. 59 p, 11 fig, 156 ref. OWRR C-4048(9009)(4).

Descriptors: *Project planning, *Urbanization, *Water quality control, Administrative agencies, Management, Pollution abatement, Underground

storage, Sewers.

Identifiers: *Innovation, *Invention, Technology transfer, Public technology, Information dis-semination, *Industrial innovation, San Francisco, Chicago area, Land wastewater disposal, Pressure wastewater sewers, Enforcement, Risk taking, Master planning, Combined sewer overflows, Metropolitan studies.

Four urban water resource case studies are employed as a means for elucidating causation in-ferences on the process of technological innovation: San Francisco Master Plan; Chicago Un-derflow Plan; Land Disposal of Wastewater; and Pressure Wastewater Sewer Systems. All four are instances where innovation concepts have been successfully applied, and they are all concerned with water quality matters. Consideration is given to industrial parallels, the roles of individuals versus groups in innovation, and certain characsus groups in innovation, and certain charac-teristics of some leading innovative local govern-ment administrators. Also taken into account are related subjects of technology transfer and public technology. However, only briefly discussed are mechanisms for translation or diffusion of the concepts used for illustration. While venturesome forefront examples are used, they are in the early stages of their evolution, as plans, process developments or demonstrations. Evident are some of the limitations in knowledge dealing with innovation, information dissemination technology transfer. W74-07720

ANALYTICAL TECHNIQUES FOR PLANNING COMPLEX WATER RESOURCE SYSTEMS. Texas Water Development Board, Austin.
Systems Engineering Div. For primary bibliographic entry see Field 6A. W74-07722

WATER RESOURCES MANAGEMENT FOR METROPOLITAN WASHINGTON: ANALYSIS OF THE JOINT INTERACTIONS OF WATER AND SEWAGE SERVICE, PUBLIC POLICY

AND LAND DEVELOPMENT PATTERNS IN AN EXPANDING METROPOLITAN AREA.

Metropolitan Washington Council of Govern-

ments, D.C.

ments, D.C. Available from the National Technical Information Service as PB-232 169, \$4.00 in paper copy, \$1.45 in microfiche. Completion Report, December 1973, 104 p., 18 fig., 4 tab, 82 ref. OWRR C-2128(3400)(1), 14-31-0001-3400.

Descriptors: *Planning, *Land use, Water supply, Water quality, Systems analysis, Decision making, Governments, Computer programs, Regional anal-*Sewers, Data collections, *District of Columbia, Model studies, Local governments, *Management, *Utilities, Cities, Urbanization. Identifiers: *Metropolitan Washington, D.C., Public policy, Population distribution, EMPIRIC Activity Allocation model.

One of the means introduced by local governments during the late sixties to slow the rate and control the location of development was the staging and programming of utilities service, particularly sewer facilities. Because of a lack of quantitative analysis on the supposed relationship of watersewer policy and growth, this study was con-ducted to: (a) identify and evaluate effects of water and sewage facilities on population and employment; and (b) develop and evaluate methods of expressing relationships between water and sewage service and urban growth in a form useful for urban water resources planning. The qualitative aspect of the study consisted of identifying, through discussions with key officials, the elements of utilities sizing, location and timing policy. The quantitative aspect centered on development of a measure of water or sewer availability that would correlate more highly with actual metropolitan development observed from 1960 to 1968 that the variable specified in the urban growth model, EMPIRIC, currently utilized in the regional planning process for Metropolitan Washington. Statistical analyses performed on a number of hypotheses resulted in improved sewer variables for use in EMPIRIC. (See also W74-07724)W74-07723

APPENDICES TO WATER RESOURCES MANAGEMENT FOR METROPOLITAN WASHINGTON: ANALYSIS OF THE JOINT IN-WASHINGTON: ANALYSIS OF THE JOINT IN-TERACTIONS OF WATER AND SEWAGE SER-VICE, PUBLIC POLICY, AND LAND DEVELOPMENT PATTERNS IN AN EXPAND-ING METROPOLITAN AREA. Metropolitan Washington Council of Govern-

ments D.C.

Available from the National Technical Informa-Available from the National Technical Information Service as PB-232 170, \$3.75 in paper copy, \$1.45 in microfiche. Completion Report, December 1973, 50 p. OWRR C-2128(3400)(1) append. 14-31-0001-3400.

Descriptors: *Planning, *Land use, Water supply, Water quality, Systems analysis, Decision making, Governments, Computer programs, *Regional analysis, *Sewers, *Data collections, *District of Columbia, *Model studies, Local governments, Utilities, Cities, Urbanization, Management. Identifiers: *Metropolitan Washington, D.C., Public policy, Population distribution, EMPIRIC Activity Allocation Model.

This Appendix presents preliminary analyses which were conducted at the beginning of the study effort, and which served as useful guides for the statistical analyses described in the main report. The Appendix also contains basic information utilized in the statistical analyses. This information and other detailed data are stored in computer files at MWCOG and are available upon request. (See also W74-07723)
W74-07724 MANAGEMENT PRIORITIES: NOW AND THE FUTURE.

T. R. Snape. Water Pollution Control, Vol 72, No 8, p 666-674,

Descriptors: *Personnal management, *Water allocation(Policy), *Water management(Applied), Administration, *Management.

Water is a growth industry, and thus has characteristic problems related to the pace of change. These problems of change essentially have to do cople and their attitudes, their adaptability, their ability to grasp and exploit new opportuni-ties, and their ability to plan and control the change. The validity of this contention is explored together with management priorities for the future from the consultant's point of view. (Sanduski-Franklin) W74-07755

SOCIAL AND ECONOMIC FACTORS IN THE ADOPTION BY INDUSTRY OF WATER POL-LUTION CONTROL MEASURES IN MIN-

Minnesota Univ., St. Paul. Inst. of Agriculture. For primary bibliographic entry see Field 5G. W74-07834

AN EVALUATION OF THE NEEDS IN FRESH-

MATCHAIN OF THE NEEDS IN FRESH-WATER RESEARCH AND RELATED PUBLIC INFORMATION FACILITIES, Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center. For primary bibliographic entry see Field 6G. W74-07838

A SUMMARY OF QUANTITY, QUALITY AND ECONOMIC METHODOLOGY FOR ESTABLISHING MINIMUM FLOWS,

Washington Univ., Seattle. J. F. Orsborn, B. W. Mar, J. W. Crosby, III, and J.

Available from the National Technical Informa-tion Service as PB232 254 \$4.00 in paper copy, \$1.45 in microfiche. State of Washington Water Research Center, Pullman, Completion Report no 13, June 1973. 86 p, 17 fig, 15 tab. OWRR B-037-WASH(1). 14-31-0001-3349.

Descriptors: *Low flow, Water allocation(Policy), Competing uses, Legal aspects, Preferences(Water rights), *Washington, Criteria, Water quality standards, Planning, Evaluation, Drainage basins, Model studies, *Recreation, *Aesthetics, *Conservation, Methodology,

The study was undertaken to develop methodologies for establishing the legally prescribed minimum flows and levels in streams and lakes in the State of Washington. As more states attempt to preserve their natural resources through the enact-ment of legislation, their efforts provide a valuable experience record. But, in establishing 'minimum' or 'base' flows in streams for the protection of natural values the development of methodology to apply the laws has not been accomplished and is of particular concern to both state and federal agencies. The overall objective of this study has been to develop methods for analysis of the quantity, quality and economic factors associated with the establishment of low-flow criteria for conserva-tion, recreation and aesthetic purposes. Results have provided methods for predicting natural low flow-recurrence interval graphs for ungaged drainage basins using only USGS 1:62,500 and 1:24,000 scale maps and correlation graphs. Also, using any desired level of flow, four different water quality parameter models were developed. The models vary in degree of sophistication to meet the degree of complexity of the particular stream involved. Economic criteria have been developed for guiding planners in evaluating the

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relative value of fisheries, recreation, and diversions. The combining of these three project components; quantity, quality, and economics, provides a sequential evaluation of factors required in viues a sequential evaluation of factors required in satisfying the intent of minimum flow laws. Results are reported in two volumes within the re-port. Vol. 1: Summary; and Vol. 2: Appendices--Methodology and Data. W74-07847

RECLAMATION RESEARCH IN THE SEVEN-TIES--FIRST PROGRESS REPORT. Bureau of Reclamation, Denver, Colo. For primary bibliographic entry see Field 4A.

W74-07922

THE ROLE OF WATER IN THE ENERGY CRI-

Nebraska Univ., Lincoln. Water Resources Research Inst. For primary bibliographic entry see Field 6D.

THE POLITICAL-SOCIAL ASPECTS OF ENER-GY-WATER RELATIONSHIPS, California Univ., Los Angeles. Public Administra-

For primary bibliographic entry see Field 6D. W74-07963

ECONOMIC ASPECTS OF RESOURCE USE WITH SPECIAL REFERENCE TO ENERGY AND WATER, Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering. For primary bibliographic entry see Field 6D. W74-07964

A SYSTEMS APPROACH TO ASSESSMENT OF RURAL WATER SUPPLY PROGRAM EFFEC-TIVENESS, Asian Inst. of Tech., Bangkok (Thailand), Dept. of

Environmental Engineering. R. J. Frankel.

Water Resources Research, Vol 10, No 2, p 163-169, April, 1974. 3 fig, 3 tab, 1 append.

Descriptors: *Potable water, *Water supply development, countries, *Systems analysis, Evaluation, *Poveloping countries, *Systems analysis, *Surveys, Water utilization, Public health, Social impact, Rural sociology, Community develop-ment, Data collections, Research, Methodology, gement, Education.

Identifiers: *Thailand, *Impact analysis, Economic implications, Complementary inputs, Resource constraints, Improvement.

Evaluation research in developing countries has been neglecting the sociopolitical, administrative, psychological, and institutional issues that in practice seem to determine project impact and effec-tiveness. It appears, for example, that provision of tiveness. It appears, for example, that provision of a community potable water system will not produce improvements in village health and sanita-tion unless it is accompanied by a carefully designed program of health education. Systems analysis was used to improve the methodology of impact evaluation by determining the role of resource constraints and complementary inputs in resource constraints and complementary inputs in the development of the rural water supply program in Thailand. An impact evaluation was undertaken to analyze the effectiveness of the National Pota-ble Water Project and to provide feedback for improving the administrative, technical, and opera-tional aspects of the program. Evaluation objectives were to provide: (1) guidelines for design, construction, finance, and administration of these projects; (2) operational guidance for management; (3) information for training plant operators; and (4) feedback on villager attitudes, water habits and use, and village development. Complementary and hidden objectives were enumerated, and several phases were delineated and used to simplify interactions and identify variables affecting program success; a detailed interaction flow chart is provided, as well as results from the collection, analysis, and feedback of field data. The methodology developed measured the social, economic and public health implications of the water projects toward achieving rural community development. Data are being collected from some 165 village projects throughout Northeast Thai-land. (Bell-Cornell) W74-08012

EARTHOUAKE DAMAGE COSTS IN THE DESIGN OF WATER RESOURCE SYSTEMS, California Univ., Los Angeles. Dept. of Engineering Systems. For primary bibliographic entry see Field 4A. W74-08018

PROBLEM OF RATIONAL USE AND CONSER-VATION OF WATER RESOURCES AND GOALS OF HYDROLOGY (PROBLEMA RAT-SIONAL NOGO ISPOL ZOVANIYA I OK-HRANY VODNYKH RESURSOV I ZADACHI GIDROLOGII), Service of the USSR,

Moscow. V. I. Korzun, and A. A. Sokolov.

Meteorologiya i Gidrologiya, No 10, p 9-17, October 1973

Descriptors: *Water utilization, *Water conserva-tion, *Water resources, *Hydrology, *Planning, Forecasting, Water balance, Water pollution, Water pollution control, Water quality, Irrigation efficiency, Drainage, Erosion. Identifiers: *USSR.

Problems of Soviet hydrology and basic scientific problems relating to rational use and conservation of water resources in the USSR are discussed. The basic scientific problems on which attention must be focused in the near future include: (1) formulation of scientific principles of redistribution of the country's water resources among excessively wet and dry regions in European Russia, Siberia, Kazakhstan, and Soviet Central Asia, and evaluation of the possible consequences of such redistribution; (2) study of natural water pollution, its effects on water quality and the biological cycle, and development of a scientific base for monitoring and controlling water pollution; (3) realization of a complex of hydrologic studies aimed at improving irrigation and drainage efficiency; (4) study of erosion; (5) improvement of methods of hydrologic calculations and forecasts; and (6) development of theoretical and experimental studies of water balance. A major organizational problem is that of establishing a national system of accountability for all types of natural waters and their usage and of conducting a state water survey on the basis of quantitative and qualitative indices. (Josefson-USGS) W74-08055

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

REDEVELOPMENT OF HAVEN SEWAGE-TREATMENT WORKS, COLCHESTER, For primary bibliographic entry see Field 5D. W74-07759

MAJOR WASTEWATER TREATMENT PLANT TO BE UPGRADED, Malcolm Pirnie, Inc., White Plains, N.Y. For primary bibliographic entry see Field 5D.

COAGULANT RECOVERY AND REUSE IN WATER RECLAMATION SYSTEMS, Virginia Polytechnic Inst. and State Univ., For primary bibliographic entry see Field 5D. W74-07844 Blacksburg.

PUMP SELECTION, Brown and Root, Inc., Houston, Tex.
For primary bibliographic entry see Field 8C.

MATHEMATICAL MODEL FOR POST AERA-Environmental Protection Agency, Cincinnati, Ohio. Advanced Waste Treatment Research Lab. For primary bibliographic entry see Field 5D. W74-08045

6D. Water Demand

SUMMARY REPORT FOR A METHODOLOGY STUDY TO DEVELOP EVALUATION CRITERIA FOR WILD AND SCENIC RIVERS, Idaho Univ., Moscow. Dept. of Agricultural Economics For primary bibliographic entry see Field 6B. W74-07608

INTERDISCIPI INARY ANALYTICAL EVALUATION OF THE UTILIZATION OF THE WATER RESOURCES OF THE RIO GRANDE IN NEW MEXICO: LOWER RIO GRANDE RE-GION, New Mexico State Univ., Las Cruces. Dept. of Agricultural Economics.

For primary bibliographic entry see Field 6B. W74-07609

GEOLOGY AND WATER RESOURCES OF THE WHARTON TRACT AND THE MULLICA RIVER BASIN IN SOUTHERN NEW JERSEY, Geological Survey, Trenton, N. J. Water Resources Div.
For primary bibliographic entry see Field 4B.
W74-07668

WATER RESOURCES OF THE LITTLE RIVER BASIN, LOUISIANA, Geological Survey, Washington, D.C. For primary bibliographic entry see Field 4A. W74-0767

ESTIMATED USE OF WATER IN FLORIDA.

1970, Geological Survey, Tallahassee, Fla. R. W. Pride.

Florida Dept. of Natural Resources, Tallahassee, Bureau of Geology Information Circular No 83, 1973. 31 p, 6 fig, 10 tab, 20 ref.

Descriptors: *Water utilization, *Florida, *Consumptive use, *Withdrawal, Municipal water, Irrigation water, Industrial water, *Water supply, Thermal powerplants, Saline water.

Water use in Florida is estimated for 1970. About water use in Fiorida is estimated to: 1970. About 15,300 mgd was withdrawn for all purposes, including public supply, rural domestic and livestock, irrigation, and industrial (including thermoelectric power). About 9,500 mgd of the total use was saline water. The remainder, or 5,800 mgd, was freshwater, withdrawn in nearly equal quantities from surface and ground sources. Most of the saline water was used for thermoelectric power generation. The average per capita use of all water in 1970 was 2,250 gpd, an increase from 332 appd in 1950. Considering freshwater only, the average per capita use was 849 gpd in 1970. The quantity of water consumed was estimated to be

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1,930 mgd in 1970, most of which was freshwater. The quantity consumed was about one-third of the total freshwater withdrawn from the source. The largest use of freshwater in Florida in 1970 was for irrigation, 2,070 mgd. The counties in southern Florida, in the Water Resources Council subregion 0309, used 75% of all water used for irrigation. The second largest use of freshwater was by industry, which required 926 mgd of self-supplied water and 166 mgd from public supply systems. The third largest use was for public supplies, 884 mgd. (Knapp-USGS)

THE ROLE OF WATER IN THE ENERGY CRISIS.

Nebraska Univ., Lincoln. Water Resources Research Inst.

Available from the National Technical Information Service as PB-232 404 \$5.75 in paper copy, \$1.45 in microfiche. Proceedings of a conference, October 23-24, 1973, Lincoln, Nebraska. Edited by K. E. Stork, (1973), 219 p, 27 fig, 21 tab, 66 ref, 2 append. OWRR A-999-NEB(13).

Descriptors: *Energy, *Water management, *Water consumption, *Water resources, *Water demand, *Conferences, Alternative water use, Water pollution, Water rates, Water utilization, Irrigation efficiency, Nuclear energy, Research and development, Technology, Water allocation, Water shortage, Water supply, Water conservations

Identifiers: *Energy crisis, *Energy-water relationship, *Energy pool, Water resources planning, Solar energy, Geothermal energy.

Ways that the water resources community could help solve national and regional energy problems are presented. Topics discussed include energywater relationship (economic, environmental, political-social, and technological), the role of water resources in the energy crisis, regional energy problems, and an assessment of research needs. While traditional energy resources have been largely exploited, and technologies associated with their development are established, great potential exists for solar and geothermal energy development. In supplementing the energy pool, however, opportunities for reducing energy requirements should not be overlooked. The water resources field has such potential through improved management, regulation, and application of the best available technology. Energy and water conservation can also be achieved through economic means, through realistic pricing policies. In addition, questions of how and where energy supplies can be conserved with minimal economic and so-cial disruption need to be answered. Uses of energy and water are highly interrelated. Ways must be found to curtail amounts and rates of water and energy consumed through new manufacturing methods, improved irrigation, better management, and other procedures. (See W74-07962 thru W74-07977) (Grden-North Carolina) W74-07961

THE ROLE OF WATER IN THE ENERGY CRI-SIS, Water Resources Council, Washington, D.C.

Water Resources Council, Washington, D.C. W. D. Fairchild.

In: The Role of Water in the Energy Crisis; Proceedings of a Conference at Lincoln, Nebr, October 23-24, 1973: Nebraska Water Resources Research Institute Publication, p 10-17, 1973. 6 ref.

Descriptors: *Water demand, *Energy, Powerplants, Water supply, Water utilization, Conferences, Geothermal studies, Water management(Applied), Thermal powerplants. Identifiers: *Energy crisis, *Energy-water relationships.

Energy is required to produce all water supplies whether it is sun energy necessary for rainfall or electrical or mechanical energy to pump water supplies from lakes, rivers or underground sources. Even the large gravity irrigation projects in the West require energy to construct the works and maintain them. Conversely, water is necessary for man to produce energy. This can range from natural rainfall to produce crops, falling water to produce hydroelectric energy, water required to mine and process coal and other energy fuels, or the large consumptive usage of water for cooling when fossil or nuclear fuel is utilized in steam plants. (See also W74-07961) (Knapp-USGS) W74-07962

THE POLITICAL-SOCIAL ASPECTS OF ENER-

GY-WATER RELATIONSHIPS, California Univ., Los Angeles. Public Administration Program.

E. A. Engelbert.

In: The Role of Water in the Energy Crisis; Proceedings of a Conference at Lincoln, Nebr, October 23-24, 1973: Nebraska Water Resources Research Institute Publication, p 18-37, 1973. 35 ref.

Descriptors: *Energy-water relationships.

The political-social aspects of water-energy relationships have been greatly neglected both in research and development. A review of the litera-ture shows that where nonphysical aspects of energy-water relationships have been analyzed, the focus is limited primarily to functional processes of power generation, pollution or similar interlinking activity. The more pervasive interrelationships of water and energy to society appear to be too ephemeral and complex to warrant penetrating investigation and analysis. The failure to comprehend and project energy-water relationships in broader social settings is producing unfortunate political consequences. Interest groups polarize around specific controversial issues which may be narrowly formulated or wrongly contrived. Amidst the political contentiousness of well-meaning but short-sighted political coalitions, more basic aspects of societal well-being become obscured or lost. New analytical approaches must be fashioned for perceiving and dealing with the social parameters of energy-water relationships. The prevailing system of analysis which rests primarily upon unilateral projections of energy and water requirements to meet the needs of a growing economy will no longer suffice. A system of analysis must show how energy-water interrela-tionships can be utilized to clarify and shape social goals and developments. (See also W74-07961) (Knapp-USGS) W74-07963

ECONOMIC ASPECTS OF RESOURCE USE WITH SPECIAL REFERENCE TO ENERGY AND WATER,

Johns Hopkins Univ., Baltimore, Md. Dept. of Geography and Environmental Engineering. R. K. Davis

In: The Role of Water in the Energy Crisis; Proceedings of a Conference at Lincoln, Nebr, October 23-24, 1973: Nebraska Water Resources Research Institute Publication, p 39-45, 1973.

Descriptors: *Water demand, *Energy, *Economics, *Political aspects, Regulation, Water utilization, Environment, Legislation, Water management(Applied), Resource allocation, Costbenefit analysis.

Identifiers: *Energy-water relationships.

Economists believe that optimum social welfare is coincident with best economic use of resources. Best economic use is defined with reference to all benefits and costs. If water is allocated among uses so that the ratio of marginal social benefits to marginal social costs is equal in all uses, the logic involved states that the most efficient use of water is achieved. If, as between two uses of water, the ratio of benefits to costs is unequal at the margin, then it is possible to improve society's welfare be

reallocating water from the use with the lower ratio of benefits to costs to the use with the higher ratio of benefits to costs, and to continue shifting the resource from one use to the other until the ratio of benefits to costs of the last increment shifted is equal in both uses. Public decision-making, as it affects the uses of water and energy, is characterized by failures to address a range of alternatives broad enough to give some hope of including superior policies. And the evaluation of alternatives is seriously hampered by cost sharing or subsidies which badly warp choices in favor of uneconomic alternatives. (See also W74-07961) (Knapp-USGS) W74-07964

ENVIRONMENTAL ASPECTS OF ENERGY-WATER RELATIONSHIPS, Nebraska Univ., Lincoln. Dept. of Agricultural

Nebraska Univ., Lincoln. Dept. of Agricultural Economics. L. K. Fischer.

In: The Role of Water in the Energy Crisis; Proceedings of a Conference at Lincoln, Nebr, October 23-24, 1973: Nebraska Water Resources Research Institute Publication, p 46-59, 1973. 1

Descriptors: *Water demand, *Energy, *Agriculture, Irrigation water, Environment, Economics, Water utilization, Industrial water. Identifiers: *Energy-water relationships.

Public policies relative to water development, which have in the past tended to transfer costs away from the principal beneficiaries, have resulted in substantial quantities of water being committed to uses which yield low returns. Increases in the cost of water to users should induce those who hold rights to water to utilize the water more judiciously and thus reduce water requirements. Of equal importance, those who would initiate water-using activities will have incentives to buy out existing water rights as an alternative costly supply augmentation. Furthermore, full-cost pricing for raw water will make more economically attractive the recycling of waste-water. Agriculture in the United States is a major user of water and energy; a use of water which yields on the margin a small value of product per unit of water; a class of use which has historically been favored by both legal preferences and public subsidies; and a use which is more tolerant of low quality than are many competing uses. Con-sequently, substantial opportunities exist or will arise for reducing the quantity of irrigation water required to produce a given product; irrigating with water which as been modified substantially by previous users thus freeing water of higher quality to less tolerant uses; and providing a source of water for alternative high-value uses by ceasing to irrigate under conditions which yield relatively low returns. (See also W74-07961) (Knapp-USGS) W74-07965

THE ROLE OF WATER RESOURCES RESEARCH IN THE ENERGY CRISIS, Office of Water Resources Research, Washington, D.C.

W. A. Hall.

In: The Role of Water in the Energy Crisis; Proceedings of a Conference at Lincoln, Nebr, October 23-24, 1973: Nebraska Water Resources Research Institute Publication, p 60-67, 1973.

Descriptors: *Energy, *Water demand, *Research and development, Water Resources Research Act, Education, Training, Water resources development.

Identifiers: *Energy-water relationships.

Water and water-related research involves transporting this needed and available resource to the places it is needed. For the western fuel sources, water is the controlling factor because it is also the scarce resource. Water will clearly limit what can

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be done in production, in conversion, in transportation, and in reclamation and environmental protection. Storage of energy has always been a major problem which has resulted in inefficiencies in its use. Water stored as geothermal energy is a particularly useful substance for efficient energy utilization. The real challenges in water resources research related to the energy crisis are to demonresearch related to the energy crisis are to demonstrate the fallacy of a policy of maintaining ignorance until the crisis stage and demonstrate the capability of the water resources research community to respond to need efficiently and effectively. (See also W74-07961) (Knapp-USGS) W74-07966

ENERGY PRODUCTION.

Omaha Public Power District, Nebr.

T. P. Harding, and B. E. Dose. In: The Role of Water in the Energy Crisis; Proceedings of a Conference at Lincoln, Nebr, October 23-24, 1973: Nebraska Water Resources Research Institute Publication, p 71-91, 1973. 15

*Water demand. *Energy, Descriptors: Descriptors: water demand, Energy, *Powerplants, Water supply, Water utilization, Conferences, Water management(Applied), Thermal powerplant, *Production.
Identifiers: *Energy-water relationships.

Of all cooling water used in the United States, 81% is used for electric power generation. The cooling method utilized greatly influences the overall efficiency of the power conversion cycle and hence is directly related to the conservation of energy resources. The mode of cooling is of prime imresources. The mode of cooling is of prime importance as it directly affects the fuel cycle efficiency to produce electrical power. Many studies are underway throughout the United States to determine the impact on the ecology by using once-through cooling. Scientific information is needed to put in perspective the possible ecological dense as the search that can be consed to present the search that can be consedered to the search that can be can damage or changes that can be caused by once-through cooling on the Missouri River and other large bodies of water. (See also W74-07961) (Knapp-USGS) W74-07967

MUNICIPAL AND INDUSTRIAL WATER

SUPPLY, Kansas Univ., Lawrence. Dept. of Civil Engineer-

ing. W. J. O'Brien.

In: The Role of Water in the Energy Crisis; Proceedings of a Conference at Lincoln, Nebr, October 23-24, 1973: Nebraska Water Resources Research Institute Publication, p 92-113, 1973. 3 fig. 9 tab, 6 ref. EPA Grant T-900135.

Descriptors: *Water demand, *Energy, *Electric power demand, Water management(Applied), Mu-nicipal water, Industrial water. Identifiers: *Energy-water relationships.

Approximately 67% of water withdrawn for municipal purposes is obtained from surface sources.

About 17% of the water withdrawn in 1970 by industry was from saline sources. Most of this was surface water. Approximately 79% of the freshwater withdrawn by industry was from surface sources. In many instances a reduction in water withdrawal will not result in a significant reduction in energy consumption by the water supply system. Most of the electrical energy used in water treatment and distribution systems is consumed by pumping. A surface water source is therefore in-herently more efficient than a groundwater supply. Smaller, more compact distribution systems are also more efficient in that booster pumping is usually reduced. Slightly more than one-third of the electrical power generated in 1970 was used to supply water to municipalities and industry. Because most of this energy is used in pumping, the most effective way to lower this energy requirement is to reduce the quantity of water used. Peak load power demands can be reduced by

the use of intermediate treated water storage or by the use of programmed pumping within the existing distribution system. (See also W74-07961) (Knapp-USGS) W74-07968

AGRICULTURAL WATER SUPPLY,

Nebraska Univ., North Platte. Dept. of Agricultural Engineering. D. G. Watts.

In: The Role of Water in the Energy Crisis, Proceedings of a Conference at Lincoln, Nebr, October 23-24, 1973: Nebraska Water Resources Research Institute Publication, p 114-127, 1973. 4 fig. 4 tab, 16 ref.

Descriptors: *Irrigation water, *Electric power demand, *Water demand, Water manage-ment(Applied), Irrigation efficiency, Irrigation practices.
Identifiers: *Energy-water relationships.

Current technological capability can achieve an overall reduction of 10% to 20% in the energy consumed annually for providing an agricultural water supply. Suggested procedures include increasing irrigation pumping plant efficiency, reducing water application, improved management of elec tric pumping plants, reuse of irrigation runoff water, and improved irrigation system design. (See also W74-07961) (Knapp-USGS) W74-07969

POLLUTION CONTROL,

New Mexico State Univ., Las Cruces. Water Resources Research Inst.

In: The Role of Water in the Energy Crisis; Proceedings of a Conference at Lincoln, Nebr, October 23-24, 1973: Nebraska Water Resources Research Institute Publication, p 128-131, 1973. 1

Descriptors: *Water demand, *Thermal powerplants, *Strip mines, Cooling water, Land reclamation, Water supply, Industrial water, Energy. Identifiers: *Energy-water relationships

Thermal generation of electric power produces a significant thermal discharge. A problem of even greater magnitude in relation to water pollution and supply may be developing in the Northern Great Plains and in the Southwestern Deserts. The states of Arizona, New Mexico, Utah, Colorado, Wyoming, Montana, and North and South Dakota contain about 70% of the nation's low-sulfur coal reserves. These reserves lie close to the surface, and strip mining procedures are being used to obtain the coal. Development of this coal resource involves legal mandates to restore the land after the coal has been removed. Water scarcity may limit the use of Western coal. The problem is that in most of the Western watersheds where immense mining, gasification and power generating complexes are envisioned, existing and potential water supplies are heavily committed and in some basins, water resources are over committed. It would require much more water to rehabilitate some of these lands than would be required initially in mining, processing and utilizing the coal. (See also W74-07961) (Knapp-USGS)

REGIONAL ENERGY-WATER PROBLEMS NORTHEAST.

Delaware Univ., Newark. Water Resources R. D. Varrin

In: The Role of Water in the Energy Crisis; Proceedings of a Conference at Lincoln, Nebr, October 23-24, 1973: Nebraska Water Resources Research Institute Publication, p 133-140, 1973. 2 Descriptors: *Delaware River, *Energy, *Water demand, *Thermal powerplants, *Nuclear powerplants, Electric power demand, Streamflow, Dams, Reservoirs, Reservoir yield.
Identifiers: *Energy-water relationships.

In early 1972, 10 power companies serving the Delaware Valley announced plans to construct 11 nuclear power stations. In addition, 6 new conventional generating stations would be built and 10 existing stations would be expanded. These projects were to be completed by 1986 and have a total generating capacity of 87,000 megawatts, nearly three times the present 33,000 megawatts. The estimated future water consumption for power would be 380 million gallons per day, 19 times the present 20 mgd. The Tocks Island project could help provide the necessary low-flow augmentation downstream while allowing New York City to divert its full allocation. In addition, the project would increase the firm water supply and offer sig-nificant flood protection. There would also be a pumped storage facility to generate additional power for the basin. The Tocks Island project has been opposed by conservationists for its potential damage to the environment. In addition to the 900 million gallons already authorized for out-of-basin transfer, a downstream flow of at least 3,000 cfs is required to protect the estuary. When the project need for 390 mgd evaporative demand for power is added, there is no way for the total depletive water demand to be met even with Tocks Island and all other developments included. (See also W74-07961) (Knapp-USGS) W74-07971

REGIONAL ENERGY-WATER PROBLEMS SOUTH ATLANTIC GULF, Georgia Inst. of Tech., Atlanta. Environmental

Resources Center.

In: The Role of Water in the Energy Crisis; Proceedings of a Conference at Lincoln, Nebr, October 23-24, 1973: Nebraska Water Resources Research Institute Publication, p 141-149, 1973. 15

Descriptors: *Water demand, *Energy, *Electric power demand, Water management(Applied), Mu-nicipal water, Industrial water. Identifiers: *Energy-water relationships.

Water provides a convenient sink for disposing of energy that cannot economically be put to beneficial use. Petroleum, nuclear and other energyoriented wastes are generated during the processes of fuel extraction, transportation, energy conversion, and residuals disposal; these wastes are often directly or indirectly discharged, accidentally spilled, or washed into streams or aquifers. Water can be used to generate electricity and provides, by far, the most economical means for supply of short-term peak demand loads. Energy is required to operate water supply and water treatment systems. Furthermore, excessive energy use tends to aggravate water pollution problems, and excessive water use tends to burden available energy supplies. Thus, technologies for improving the efiency fo energy generation, transmission, and utilization and economic and social incentives for reducing low value or unnecessary energy use also have water resources management benefits. (See also W74-07961) (Knapp-USGS)

REGIONAL ENERGY-WATER PROBLEMS, OHIO-GREAT LAKES.

Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources. I. C. Frey

In: The Role of Wate88in the Energy Crisis; Proceedings of a Conference at Lincoln, Nebr, October 23-24, 1973: Nebraska Water Resources Research Institute Publication, p 150-155, 1973.

Field 6-WATER RESOURCES PLANNING

Group 6D-Water Demand

Descriptors: *Water demand, *Emergy, *Electric power demand, Water management(Applied), Municipal water, Industrial water, *Great Lakes Region, Ohio.

Identifiers: *Energy-water relationships

The four major energy-water related problems in the Ohio-Great Lakes Region are: thermal pollu-tion from a shift to nuclear energy; coal mine drainage from an expanded use of coal for energy; nonpoint pollution from an expanded output of energy-producing farm crops; and navigation and other flow resource developments. Shifts from one source of energy to another transfer the burden of pollution from one natural resource to another. Rule out high sulfur coal to protect the air, and the replacement with nuclear fuel becomes an environmental threat to streams and lakes. Switch to the strip mining of low sulfur coal. and the burden of environmental deterioration is transferred to the land. Try geothermal fluids for power and the discharge of brine presents once again a water quality problem. (See also W74-07961) (Knapp-USGS) W74-07973

REGIONAL ENERGY-WATER PROBLEMS, MISSOURI RIVER, North Dakota State Univ., Fargo. Water

Resources Research Inst.

D. O. Anderson.

In: The Role of Water in the Energy Crisis; Proceedings of a Conference at Lincoln, Nebr, October 23-24, 1973: Nebraska Water Resources Research Institute Publication, p 156-164, 1973. 1

Descriptors: *Water demand, *Energy, *Electric power demand, Water management(Applied), Mu-nicipal water, Industrial water, *Missouri River basin, Water pollution sources. Identifiers: *Energy-water relationships.

Coal development in the Northern Great Plains Coal development in the Northern Oreal Figure during the next 20 years will be extensive. Montana, North Dakota and Wyoming all have extensive coal resources. The Fort Union coal bedwhich underlie a large area of northeastern Wyoming, southeastern Montana and western North ing, southeastern Montana and western North Dakota appear to offer the greatest potential for development. The Fort Union reserves account for 40% of the total United States coal reserves and as much as 90% of the low-sulfur reserves. Total Fort Union reserves have been estimated at 1.3 trillion tons. Given the present state of technology and demand for energy, it is estimated that more than 60 billion tons predicted to be available in the three states are economically strippable. While there is probably sufficient water available in most areas to meet the requirements of mining and reclamation activities, there is insufficient ground and surface water in the major coal rich areas to meet the requirements of large-scale conventional electric generation or coal gasifica-tion and liquefaction facilities. Since many coal seams in the West are aquifers, strip mining for coal will inevitably disrupt groundwater patterns in those areas. This will affect the quality and quantity and even availability of water. Mining may also disrupt natural drainage networks, and thereby disrupt downstream water rights. The potential effects of disposing of wastes of coal conversion plants in the ground and surface hydro-sphere are shown. (See also W74-07961) (Knapp-USGS) W74-07974

REGIONAL ENERGY-WATER PROBLEMS, PACIFIC NORTHWEST, North Dakota State Univ., Fargo. Water

Resources Research Inst. C. C. Warnick.

The Role of Water in the Energy Crisis; Proceedings of a Conference at Lincoln, Nebr, October 23-24, 1973: Nebraska Water Resources Research Institute Publication, p 165-178, 1973. 5 fig, 2 tab, 4 ref.

Descriptors: *Water demand, *Energy, *Electric power demand, Water management(Applied), Municipal water, Industrial water, *Pacific Northwest

Identifiers: *Energy-water relationships

The hydropower potential of the Northwest U.S. is about exhausted. This has been worsened by the fact that in the Northwest society does not want any more large dams. More critical in the Pacific Northwest is the fact that the region is suffering a record low in streamflow runoff. This comes following some very high years of runoff that conditioned society to not anticipate such a crisis. Con-tributing to the problem is the fact that nuclear and fossil fuel plants programmed for increased production are behind schedule and have had operating problems. (See also W74-07961) (Knapp-USGS) W74-07975

REGIONAL ENERGY-WATER PROBLEMS, SOUTHERN PLAINS, Texas A and M Univ., College Station. Water

Resources Inst.

J. R. Runkles.

In: The Role of Water in the Energy Crisis; Proceedings of a Conference at Lincoln, Nebr, October 23-24, 1973: Nebraska Water Resources Research Institute Publication, p 179-191, 1973. 5

Descriptors: *Water demand, *Energy, *Electric power demand, Water management(Applied), Municipal water, Industrial water, *Great Plains. Identifiers: *Energy-water *Southern Great Plains

The states of the Southern Plains Region play an important role in the nation's energy problems. These states are a major source of the domestic supply of oil and natural gas resources and are a major consumer of electrical energy. Each state in the region is experiencing a rapid growth in the industrial and urban sectors and the associated increased demand for energy. Substantial quantities of water are needed to produce oil and natural gas resources. In the Southern Plains Region, 8,225 million gallons of water per day are used for elec-tric power generation. The Federal Power Commission estimates that to the year 1990, the con-denser requirement for water will increase about six times and the consumptive use of water will increase about five times over the period 1965-1990. (See also W74-07961) (Knapp-USGS) W74-07976

REGIONAL ENERGY-WATER PROBLEMS--COLORADO RIVER-GREAT BASIN,

Colorado State Univ., Fort Collins. Environmental Resources Center.

N. A. Evans. In: The Role of Water in the Energy Crisis; Proceedings of a Conference at Lincoln, Nebr, October 23-24, 1973: Nebraska Water Resources Research Institute Publication, p 192-194, 1973.

Descriptors: *Water demand, *Energy, *Electric power demand, *Colorado River basin, Water management(Applied), Municipal water, Industrial

Identifiers: *Energy-water relationships.

A large portion of the nation's uranium deposits are contained within the Colorado River Basin. Geothermal resources are known but not fully inventoried. It is thought that most of this energy is associated with saline waters which present associated with saline waters which present disposal problems. Power generation by coal requires around 15 acre-feet per megawatt. With 30,000 MW coal generation expected by 1990, the water demand in the Basin for this purpose will be 450,000 acre-feet per year. This amount of water is available within the various state allocations from the Colorado River. An oil shale operation producing one million barrels per day will require 120,000

acre-feet of water per year. To that requirement must be added approximately 4,000 acre-feet per year which will be required to sustain vegetation on reclaimed land and shale residue. This amount of water is expected to be available from that reserved by the federal government, although claimed federal rights are in dispute. Nuclear stimulation of natural gas reservoirs has a very small water requirement. The impact of this potensmall water requirement. In impact of this potential energy source on water supplies can be considered nil. In general, state policies on energy resource development are lacking. The intermingled land ownership creates multi-jurisdictional problems because energy resources do not follow jurisdictional boundaries. The issue is how to ob-Julistictional obtained its. The Issue is flow to obtain harmony in land use regulation. Environmental guidelines are needed which will protect the land and water resources. (See also W74-07961) (Knapp-USGS) W74-07977

EFFECTS OF COLORADO RIVER WATER QUALITY AND SUPPLY ON IRRIGATED AGRICULTURE,

Economic Research Service, Davis, Calif. For primary bibliographic entry see Field 3C. W74-08014

INDUSTRIAL APPLICATION OF WHITFORD'S DEMAND FORECASTING PROCEDURE, Southern Methodist Univ., Dallas, Tex. Inst. of

M. A. Collins, and A. H. Plummer, Jr. Water Resources Research, Vol 10, No 2, p 345-347, April 1974. 2 fig, 15 ref.

Descriptors: *Water demand, *Forecasting, *Probability, *Industrial water, *Water quality, Planning, River basins, Information, Cooling, Electricity, Water utilization, Mathematical models, Systems analysis, *Texas.

Identifiers: *Steam-electric power generation, *Trinity River Basin(Tex.).

probabilistic method developed by Whitford (1972) for residential water demand forecasting is applied to water demand for steam-electric power generation in the Trinity River basin in Texas in order to reduce reliance upon single isolated esti-mates of future demand. The forecast of water demand for cooling purposes in the production of electricity has been necessary as part of an overall assessment of the impact of water use on future water quality conditions in the basin. The resulting time-dependent cumulative probability distributions provide useful information for water quality planning in the basin. It is suggested that this probabilistic approach has significant advantages that warrant its further refinement. (Bell-Cornell) W74-08015

6E. Water Law and Institutions

SURVEY OF OREGON'S WATER LAWS. Oregon Univ., Eugene. School of Law C. D. Clark.

Available from the National Technical Informa-Available from the National Technical Informa-tion Service as PB-232 076, \$6.00 in paper copy, \$1.45 in microfiche. Oregon Water Resources Research Institute, Corvallis, Completion report WRRI-18, March 1974. 217 p. OWRR A-002-ORE(8) and A-008-ORE(2).

Descriptors: *Water law, Legislation, *Oregon, *Water permits, *Riparian rights, Legal aspects, *Prior appropriation, Boundaries(Property).

Legal aspects of the following topics are discussed: Water lands and boundaries; Liability for escaping water; The Riparian Doctrine in Oregon; Classification of waters; The Permit System and the Appropriation Doctrine in Oregon; Diffused surface water and drainage; and Ground waters. W74-07611

WATER RESOURCES PLANNING-Field 6

Nonstructural Alternatives—Group 6F

GROUNDWATER POLLUTION FEATURES OF FEDERAL AND STATE SATUTES AND REGULATIONS,

Geraghty and Miller, Port Washington, N.Y. For primary bibliographic entry see Field 5G.

FEDERAL LAWS AND REGULATIONS, For primary bibliographic entry see Field 5G. W74-07703

INNOVATION: A CASE STUDY, American Society of Civil Engineers, New York. For primary bibliographic entry see Field 6B. W74-07720

STATE ORGANIZATION FOR WATER RESOURCES MANAGEMENT,
Georgia Inst. of Tech., Atlanta. Environmental

Resources Center.

G. R. Elmore, Jr.

Available from the National Technical Information Service as PB-232 142, \$11.00 in paper copy, \$1.45 in microfiche. Report No ERC-0472, May 1972, 143 p, 2 fig, 7 tab, 97 ref, 2 append.

Descriptors: Management, *Georgia, Administrative agencies, *Institutions, Institutional con-straints, *State governments.

Identifiers: *State water agencies, Public administration, State water program, *Administrative organization.

Responsibilities of the states for water resources management have been increasing to meet the of the public and the requirements of Federal programs. Georgia is a state with abundant water resources but the minimum attention it gives to water resources management has proven unsatisfactory to those who desire a more com-prehensive and coordinated effort. The organizational structure of resources agencies in Georgia has appeared to impede coordination and com-prehensive management. While reorganization seems necessary for improved State programs, disagreement exists over the appropriate organizational structure and over the importance of organizational structure to achieving better water resources management. The natural resources organizational structure of Georgia is compared to that of five other states in terms of a research model from public administration theory. An ideal state water resources program is outlined, applied to Georgia's situation, and used to examine the effect of organizational structure on water resources programs. Although available techniques of analysis and data are not sufficient to define organizational structure as cause and program as effect, the structural forms recommended by public administration theory are regularly associated with more highly developed programs. Shortcomings of Georgia's water resources programs which appear to be related to organization are interagency conflict, ineffective leadership from the governor, difficulty in adapting to change, and the omission of programs for water resources planning, flood pro-tection, dam safety and water rights. Possibilities for improvement are discussed. (See also W69-00331) (James-Georgia Tech) W74-07733

REGIONAL WATER AUTHORITIES: OR-GANIZATIONAL PATTERNS-PURPOSE OR PROFESSIONAL, For primary bibliographic entry see Field 5G. W74-07754

EFFLUENT STANDARDS STRATEGY: REJU-VENATION OF AN OLD GAME PLAN, Cincinnati Univ., Ohio. Coll. of Medicine For primary bibliographic entry see Field 5G.

SOCIAL AND ECONOMIC FACTORS IN THE ADOPTION BY INDUSTRY OF WATER POL-LUTION CONTROL MEASURES IN MIN-LUTION

Minnesota Univ., St. Paul. Inst. of Agriculture. For primary bibliographic entry see Field 5G. W74-07834

THE COLUMBIA INTERSTATE COMPACT: POLITICS OF WATER RESOURCES IN THE PACIFIC NORTHWEST, Washington State Univ., Pullman. Dept. of Political Control Of Politi

cal Science.

P. Beckett, and H. R. Doerksen.

Available from the National Technical Information Service as PB-232 255 \$3.00 in paper copy, \$1.45 in microfiche. Completion Report, January 1973, 14 p. OWRR A-055-WASH(3), 14-31-0001-

Descriptors: *Regional development, Administrabescriptors. *Regional development, Administrative agencies, *Columbia River, Intergovernmental relations, *Pacific Northwest U.S., Washington, Water resources development, Interstate compacts, *Political aspects.

The Columbia Interstate Compact represented an attempt to establish a regional institutional mechanism for river basin development. After seven Pacific Northwest states spent 18 years negotiating the Compact, and five attempts were made to ratify the Compact in the state legisla-tures, Oregon and Washington had not ratified. This study is in essence a history of the Compact negotiations, describing the efforts of the seven states in the context of the political environment in which the Compact was negotiated. Several fac-tors which contributed to the ultimate dissolution of the negotiating effort are analyzed in some depth. First, role perception (sense of negotiating objectives) of Compact commissioners varied substantially from state to state and within states in a period of time when attitudes related to river basin development were typically strong and polarized. Second, the negotiating environment changed in such a way as to reduce the perceived need for a Compact. Finally, financial crisis, after Washington and Oregon discontinued financial support of the effort, forced the Compact Commission to close its office. The most devasting defeat of the Compact attempt came in the Washington Legislature. There the Compact became embroiled in the existing conflict regarding power generation and marketing. Although the Compact effort may be dead, most issues with which it dealt, including allocation of water, reservation of power for states in which a dam is constructed, and out-of-basin diversion, are very much alive. W74-07846

GROUNDWATER ISSUE MERITS MORE FEDERAL PROTECTION. GROUNDWATER POLLUTION AND CONSERVATION, For primary bibliographic entry see Field 5G. W74-07854

PREVENTION OF DAMAGE TO PIPELINES. National Transportation Safety Board, Washing-For primary bibliographic entry see Field 8A. W74-07923

A BILL TO AUTHORIZE THE SECRETARY OF THE INTERIOR TO ENGAGE IN FEASIBILITY INVESTIGATIONS OF CERTAIN POTENTIAL WATER RESOURCE DEVELOPMENTS. Senate Bill 3959, 92nd Cong., 2d Sess. (October 1972). 2 p.

Descriptors: *Water resource development, *Legislation, *Potential water supply, *Feasibility studies, Ground water resources, United States, Oklahoma, North Dakota, South Dakota, Montana, Colorado, New Mexico, Optimum development clears blessing. ment plans, Planning.

This bill passed the Senate after being amended on October 2, 1972. The bill authorizes the Secretary of the Interior to engage in feasibility investiga-tions of certain potential water resource developnents. The bill as introduced only included areas in southwestern Oklahoma and central North Dakota. The bill was amended in the Senate to in-clude projects in South Dakota, Montana, Colorado and New Mexico. The bill was referred to the House Committee on Interior and Insular Affairs. (See also W74-07284) (Daniels-Florida) W74-07943

COOPERATION INTERNATIONAL HYDROLOGISTS (MEZHDUNARODNOYE SOTRUDNICHESTVO GIDROLOGOV), Gosudarstvennyi Gidrologicheski Institut, Lenin-

grad (USSR). For primary b W74-08047 bibliographic entry see Field 7A.

ALL-UNION HYDROLOGIC CONGRESSES (VSESOYUZNYYE **GIDROLOGICHESKIYE**

SYEZDY), Gosudarstvennyi Gidrologicheskii Institut, Leningrad (USSR). A. A. Sokolov.

Meteorologiya i Gidrologiya, No 10, p 3-8, October 1973. 2 fig.

Descriptors: *Conferences, *Hydrology, *Water resources, *History, *Planning, Forecasting, Water balance, Water utilization, Water conservation, Water pollution control. Identifiers: *USSR.

During the first years of growth of the Soviet state, the government devoted its attention to the need for a detailed study of the country's water resources. In 1919 the Russian Hydrologic Institute (renamed the State Hydrologic Institute in 1926) was organized as the central scientific establishment in the field of hydrology. In 1921 establishment in the field of hydrology. In 1921 preparations began to convene the First All-Russian Hydrologic Congress, which was held May 7-14, 1924. The Second All-Union Hydrologic Congress was held April 20-27, 1928 and the Third Congress, October 7-17, 1957. All of the Congresses were held in Leningrad. The Fourth All Union Hydrologic Congress was convened in Leningrad in October 1973 to discuss current problems of modern hydrology connected with improblems of modern hydrology connected with implementation of measures on rational use of water resources of the USSR and their protection from pollution and depletion. Attention was focused on theoretical and procedural problems of hydrology; received and procedural problems of hydrology experimental investigations and techniques of mathematical simulation of hydrologic processes; requirements for accuracy of measurements, methods of calculation and forecasting of items of the hydrologic regime; estimation of quantitative and qualitative changes in water resources and items of the hydrologic regime under the influence of economic activity. Scientific papers on individual aspects of hydrology were discussed at 9 sessions of the congress: (1) water balance and runoff calculations; (2) hydrologic problems of water management; (3) hydrologic forecasts; (4) surfacegroundwater relationships; (5) hydrology of lakes, reservoirs, and estuaries; (6) water quality and scientific principles of water conservation; (7) channel processes; (8) hydrometry and keeping of state records on water; and (9) hydrophysics. At plenary sessions of the congress, general papers were presented on the basic problems of hydrology. (Josefson-USGS) W74-08056

6F. Nonstructural Alternatives

THE METHODOLOGY OF BAYESIAN INFERENCE AND DECISION MAKING APPLIED TO EXTREME HYDROLOGIC EVENTS Massachusetts Inst. of Tech., Cambridge. Dept. of Civil Engineering.

Field 6-WATER RESOURCES PLANNING

Group 6F-Nonstructural Alternatives

For primary bibliographic entry see Field 2A. W74-07601

6G. Ecologic Impact Of Water Development

ENVIRONMENTAL EFFECTS OF THE CONSTRUCTION AND OPERATION OF A GASE-OUS DIFFUSION PLANT.
Goodyear Atomic Corp., Portsmouth, Ohio.
For primary bibliographic entry see Field 5C.

ENVIRONMENTAL STATEMENT RELATED TO CONSTRUCTION AND OPERATION OF BARNWELL NUCLEAR FUEL PLANT. Directorate of Licensing, Fuels and Materials (AEC), Washington, D.C. For primary bibliographic entry see Field 5B. W74-07792

RADIONUCLIDES IN ECOSYSTEMS, VOLUME

Oak Ridge National Lab., Tennessee For primary bibliographic entry see Field 5C. W74-07799

THE EFFECTS OF RIVER FLUCTUATIONS RESULTING FROM HYDROELECTRIC PEAK-ING ON SELECTED AQUATIC INVER-TEBRATES,

Idaho Univ., Moscow. Coll. of Forestry, Wildlife and Range Sciences.

For primary bibliographic entry see Field 2I. W74-07830

AN EVALUATION OF THE NEEDS IN FRESH-WATER RESEARCH AND RELATED PUBLIC INFORMATION FACILITIES.

Cornell Univ., Ithaca, N.Y. Water Resources and Marine Sciences Center.

R. T. Oglesby, and J. D. Parkes. Available from the National Technical Informa-tion Service as PB-232 227, \$3.25 in paper copy, \$1.45 in microfiche. Technical Report 74, August 1973. 24 p, 9 fig. OWRR A-048-NY(1). 14-31-0001-

Descriptors: *Freshwater, *Research facilities, *Evaluation, *Design, Aquatic environment, Ecology, Planning, Architecture, Information exchange.

Identifiers: *Public information.

The process of designing a research and public information center related to aquatic ecology should involve the following components: (1) The formation of a design 'team' whose key members are an aquatic ecologist and an architect, (2) education of 'team' and development of communication between the scientist and architect, (3) location of a site, (4) definition of the functional objectives of the facility, and (5) prescription of functional rela tionships and space needs for the various parts of the facility. An example of the design process is provided and this includes a discussion of planning rationale, sketches of functional relationships, schematic building elevations, cross section and floor plan, and an architectural rendering. The present status of design for freshwater facilities is briefly reviewed and the need for new concepts to meet the present and future requirements of aquatic ecologists emphasized. W74-07838

THE STATE OF THE SYSTEM (SOS) MODEL: MEASURING GROWTH LIMITATIONS USING GEOLOGICAL CONCEPTS,

Chase, Rosen and Wallace, Inc. Alexandria, Virginia E. R. Williams, and P. W. House.

Copy Available from GPO Sup Doc as EP1.23:660/5-73-013, \$3.45; microfiche from NTIS as PB-232 941 \$1.45. Environmental Protection Agency, Environmental Study Series Report EPA-600/5-73-013, February 1974. 344 p, 61 fig. 27 ref, 9 append. EPA Program Element 1HA096. Contract GS-03S-38351

Descriptors: *Simulation analysis, Regional economics, Ecology, Economics, Input-Output analysis, *Resource allocation, *Carrying capaci-ty, *Model studies, *Ecosystems, Systems analy-sis, Methodology, Measurement.

The State of the System (SOS) Model is the result of an attempt to develop a methodology that re-lates ecological concepts including regional carrying capacity to the social scientists' concepts of re-gional growth and development, and quality of life. SOS should be considered at this time as only a cenceptual research tool. The initial operational model, SOS-1, was developed to investigate details of the results predicted by the theory and to explore data requirements and needs. Therefore, the results of the model runs provided are purely illustrative and should be interpreted using ex-treme care. The SOS Model began as an attempt to provide an example form a constrictor model of hotel and can be considered in the decision Analysis System (DAS) to be used in conjunction with the General Environmental Model (GEM). It is intended that the later developments of SOS should complete this development as a constrictor model within DAS as well as continue its refinement as a stand-alone analysis tool. The model, as given in the SOS-1 form, is flexible and new data and algorithms can be substituted with relative ease. In order to maintain this ease in later, more complex versions, segmentation of its procedures into smaller modules would be useful. Such a form will increase the utility of SOS as an educational and research tool. (EPA) W74-07958

ENVIRONMENTAL ASPECTS OF ENERGY-WATER RELATIONSHIPS, Nebraska Univ., Lincoln. Dept. of Agricultural

Economics. For primary bibliographic entry see Field 6D. W74-07965

RESEARCH TO DETERMINE THE ENVIRON-MENTAL RESPONSE TO THE DEPOSITION OF SPOIL ON SALT MARSHES USING DIKED AND UNDIKED TECHNIQUES.

Skidaway Inst. of Oceanography, Savannah, Ga. Available from the National Technical Informa-tion Service as AD-763 920. Army Corps of En-gineers. Report March 1973. 189 p. 25 fig, 46 tab, 9 ref. DACW-21-71-C-0020.

Descriptors: *Sediments, *Environmental effects, *Disposal, *Dredging, *Deposition(Sediments), *Spoil banks, Salt marshes, Dikes, Water quality, Channel improvement, Fish, Invertebrates, Benthic fauna, Hydraulic equipment, Biota, Vegetation regrowth, North Carolina, South Carolina, Georgia, Marsh plants, Nutrients. Identifiers: *Spoil disposal, Spartina alterniflora, Hydraulic deddes, Bruswick Heathor(Ga.) Terry Hydraulic dredges, Brunswick Harbor(Ga.), Terry Creek(Ga.), Little Mud River(Ga.), Cooper River(S.C.), Cape Fear River(N.C.).

Environmental effects of hydraulic pipeline dredging where spoil material is deposited on marsh areas were studied. Some of these areas are diked to confine the spoil material, some are not. Relative merits of these techniques on the basis of ecological and water quality considerations were determined as the biological aspects are significant to any type of dredging. Water quality changes during dredging operations cannot be predicted on the basis of simple bulk chemical analysis of sedi-ments to be dredged. Since ammonia is the constituent released to the greatest extent during dredging, macrophyte succession within spoil areas must be considered. No effect of dredging on standing crops of species composition in areas having undiked spoil banks was observed. In one diked area examined, there was some indication that numbers of individuals and species were reduced following dredging for about two months. Studies concerned with regeneration of Spartina salt marshes dealt with ways of transplanting Spartina springs and with establishing successful methods of seed germination to help accelerate revegetation and lead to utilization of dredge spoil material for new salt marsh areas. (Jones-Wiscon-W74-07990

7. RESOURCES DATA

7A. Network Design

A GROUND-WATER MONITORING NET-WORK FOR KOOTENAI FLATS, NORTHERN IDAHO.

Geological Survey, Boise, Idaho.

N. P. Dion, and R. L. Whitehead.
Idaho Department of Water Administration Water
Information Bulletin No33, December 1973. 41 p, 10 fig, 1 tab, 6 ref, 2 append.

Descriptors: *Water levels, *Reservoirs, *Alluvium, *Idaho, *Surface-groundwater relationships, Observation wells, Water level fluctuations, Instrumentation, Network design, Monitor-

Identifiers: *Kootenai Flats(Idaho).

To measure the effects of the new river-stage regulation on the groundwater system, a network of 82 shallow and two deep observation wells was established on the Kootenai flats, Idaho, in 1971. The water table in the fine-grained sediments of The water table in the fine-grained sediments of the Kootenai flats area is very shallow and is influenced in part by the stage of the Kootenai River. The operation of newly built Libby Dam, near Libby, Montana, will change the long established patterns of river-stage and, consequently, of water-table fluctuations. This report also describes the nature and availability of the interesting the stage of the formation that was collected as part of earlier investigations. A comparison of the groundwater levels measured during 1930-54 with the few levels measured in the new observation wells indicates that no significant trends in water levels have occurred in the area between 1954 and 1973. (Knapp-W74-07662

INTERDISCIPLINARY MONITORING OF THE

NEW YORK BIGHT, Grumman Aerospace Corp., Bethpage, N.Y. For primary bibliographic entry see Field 5A. W74-07764

COOPERATION INTERNATIONAL OF HYDROLOGISTS (MEZHDUNARODNOYE SOTRUDNICHESTVO GIDROLOGOV). Gosudarstvennyi Gidrologicheski Institut, Lenin-

grad (USSR). A. G. Kovzel'.

Meteorologiya i Gidrologiya, No 10, p 110-122, October 1973, 18 ref.

Descriptors: *Hydrology, *International Hydrological Decade, *Data collections, Foreign countries, Networks, Stations, Basins, Demon-stration watersheds, Water balance, Floods, Con-ferences, Publications, History.

Identifiers: *USSR, United Nations Educational, Scientific, and Cultural Organization(UNESCO), World Meteorological Organization(WMO).

International cooperation of hydrologists after the framework of the International Hydrological Decade (IHD) is reviewed. Purposes and goals of IHD, the IHD station network of the USSR and of the world, IHD investigations of water balance and floods of representative and experimental basins, and the future of the international hydrological program are discussed. The interna-tional network of IHD stations presently consists of 1,493 river hydrometric stations, 263 lake stations, 647 evaporation stations, 132 lysimeter stations, and 204 experimental and 584 representative basins Groundwater-level observations are being conducted at 1,600 IHD observation wells. IHD river-station density for the world averages 1 per 100,000 sq km. In individual countries this density varies widely. In Czechoslovakia, station density is 1 per 2,000 sq km; in Rumania, 1 per 10,000 sq km; in Spain, 1 per 30,000 sq km; in the USSR, 1 per 45,000 sq km; in the United States, 1 per 80,000 sq km; and in Brazil, 1 per 140,000 sq km. In countries of Equatorial West Africa, this density ranges from 1 station per 17,000 sq km in Ghana and Cameroon to 1 station per 100,000 to 200,000 sq km in Senegal, the Niger Republic, Nigeria, Mali and Chad, and 1 station per 300,000 sq km in India and Australia. The network of IHD stations in the Soviet Union includes 327 river stations, 30 lake stations, 40 evaporation stations, 59 lysimeter stations, 19 experimental and 188 representative basins, and 400 groundwater observation wells, of which 233 are located in representative and experimental basins. Since 1968, annual meetings have been held among representatives of national IHD committees of Bulgaria, Hungary, the GDR, Poland, Rumania, the USSR, and Czechoslovakia for mutual exchange of information on the course of national IHD programs. (Josefson-USGS)

STATE RECORD KEEPING ON WATER AND ITS USAGE AND HYDROLOGIC CALCULA-TIONS AND FORECASTS (GOSUDARSTVENNYY UCHET VOD 1 IKH ISPOL'ZOVANIYA I GIDROLOGICHESKIYE
RASCHETY I PROGNOZY),
Hydrometeorological Service of the USSR,

S. K. Cherkayskiy.

Meteorologiya i Gidrologiya, No 10, p 18-26, October 1973. 2 fig.

Descriptors: *Data collections, *Hydrologic data, *Water utilization, resources. *Forecasting, Water users, Water consumption(Except consumptive use).
Identifiers: *USSR.

Hydrologic data collection in the USSR is based upon principles established in 1973. It consists of unified systems of gathering and processing information for a USSR state water survey. All water bodies in the USSR constitute a single state water supply consisting of (1) rivers, lakes, reservoirs, other surface bodies of water, and water sources, and waters of canals and ponds; (2) glaciers; (3) groundwater; (4) inland seas and other inland sea waters of the USSR; and (5) territorial waters (territorial seas) of the USSR. This unified system of data collection and its usage is designed to obtain reliable and exhaustive data on quantity and quality of surface waters and groundwater, their regimes, and use. Between 1940 and 1970, total water consumption by main branches of the national economy increased by more than 4 times, industry by more than 8 times and agriculture by almost 3 times. Water consumption in agriculture occupies more than 60% of the total water consumption. According to forecasts by Gidroproyekt (All-Union Experimental Design and Planning Scientific Research Institute im. S. Ya. Zhuk) the volume of water consumed in the USSR will approximately triple by the year 2000. Data flow in the unified state system for record keeping on water and its use, and structure of the USSR state water survey are diagrammed. (Josefson-USGS) W74-08054

7B. Data Acquition

USE OF FLUORESCENT DYE TRACERS IN

MOBILE BAY, Food and Drug Administration, Dauphin Island, Ala. Gulf Coast Technical Services Unit. For primary bibliographic entry see Field 5B. W74-07642

EQUIPMENT AND INSTRUMENTATION For primary bibliographic entry see Field 5B. W74-07660

THE ELECTRICAL RESISTIVITY METHOD (PART I), Keck Consulting Services, Inc., East Lansing,

Mich.
R. C. Minning.
Water Well Journal, Vol 27, No 6, p 17-21, June, 1973. 3 fig. (Technical Memo No 3).

Descriptors: *Electrical resistivity, Porosity, Conductivity, 'Rock properties, Exploration, Ground water resources, 'Groundwater potential, Equipment, Geophysics, On site investigation, 'Subsurface investigations, 'Remote sensing, Identifiers: Clays, Shales, Limestones, Granites, Apparent resistivity.

The electrical resistivity method is rapidly gaining acceptance as a technique for use in the search for ground water supplies. The method offers a faster, more economical means of exploring the subsurface than is generally possible through direct ex-ploration by drilling. Furthermore it is based on sound, well-established physical principles and can be used by anyone. Earth materials all have their own characteristic resistance to the flow of electric current. In general, resistivity decreases as porosity, water content, and water conductivity (salinity) increase. This principle provides a basis for distinguishing between various types of subsurface materials. Fine-grained sediments, such as clays and their bedrock counterpart the shales, have low resistance to current flow. Resistivity values for such materials generally fall in the range of 20 to 200 ohm-ft (ohm-ft being the unit of resistivity). Coarser grained sediments such as sands and gravels have higher resistivities, in the order of 200 to 2,000 ohm-ft. Weathered bedrock surfaces and secondary porosity such as faults, fractures, and solution openings, tend to lower these values. Methods for determination and interpretation of electrical resistivity values are presented. (Hunt-NWWA) W74-07852

VARIATIONS IN THE DESIGN OF DEPTH SAMPLERS FOR USE IN GROUNDWATER STUDIES,

Institute of Geological Sciences, London (England). Dept. of Hydrogeology. For primary bibliographic entry see Field 8G.

PLEISTOCENE-HOLOCENE SEDIMENTS IN-TERPRETED BY SEISMIC REFRACTION AND WASH-BORE SAMPLING, PLUM ISLAND-CAS-TLE NECK, MASS.,

Army Coastal Engineering Research Center, Fort Belvoir, Va. For primary bibliographic entry see Field 2L. W74-07875

RESEARCH - - TARGETS AND DEVELOP-MENTS, REGIONAL ASSESSMENTS Newcastle Univ. (Australia). Dept. of Physics. C. D. Ellvett.

Presented at International Groundwater Symposium, November 20-22, 1973, Macquarie University, Sydney, Australia. 5 p.

Descriptors: *Exploration, *Remote sensing, Locating, *Prospecting, Groundwater, Terrain analysis, Subsurface investigations, Evaluation,

Identifiers: *Thermal studies, Heat picture, *Infra-red studies, Thermal variation.

Thermal infra-red studies of ground and water by use of an air-borne scanner produce a heat picture of that area of the earth's surface scanned by the instrument. Tonal patterns depict thermal variations as small as 0.5C, but thermal infrared imagery is effective only at the terrain surface with negligible penetration. This tool is useful in hydrologic studies because of the exceptionally high specific heat of unity for water relative to other materials. Among its numerous applications are the following: surveying for leakage of water from dams and reservoirs; monitoring the flow of water through porous material; detection of subterranean streams and near surface water which may be reflected as cool areas at valley bottoms or topographic lows where there is no visible surface evidence of such phenomena. It is also possible, by studying the geological structures revealed in this way, to determine which areas are more likely to be productive of groundwater. (Campbell-NWWA) W74-07903

EXPLORATION FOR A BURIED VALLEY BY RESISTIVITY AND THERMAL PROBE SUR-

Harshbarger and Associates, Tucson, Ariz For primary bibliographic entry see Field 2F. W74-07935

APPLICATION OF REMOTE SENSING TO HYDROLOGY-FINAL TECHNICAL REPORT, IBM Electronics Systems Center, Huntsville, Ala. For primary bibliographic entry see Field 2A. W74-07940

THEORY AND APPLICATION OF CONTINU-OUS MONITORING FOR CHEMICAL
RESEARCH IN NATURAL WATER SYSTEMS,
For primary bibliographic entry see Field 5A. W74-07985

ACQUISITION SYSTEM FOR DATA ECOLOGICAL FIELD STUDIES, Oak Ridge National Lab., Tenn.
C. D. Martin, J. T. Hutton, and R. L. Simpson.

Available from the National Technical Information Service as CONF-730419-1, \$3.00 in paper copy, \$1.45 in microfiche. Atomic Energy Commission, Oak Ridge, Tenn. (Undated report). 4 p. 2 fig. 3 ref.

Descriptors: *Data collections, *Automation, *Telemetry, Water levels, Stream gages, Compu-ters, Rainfall, Runoff, Tennessee. Identifiers: Oak Ridge(Tenn.).

In an ecology field study area near the Oak Ridge National Laboratory, rainfall and streamflow are routinely monitored using automatic precipitation recorders and water-level (stage height) recorders. A small computer-based data aquisition system was designed to monitor the field sensors, detect possible sensor failures and produce alarms, record data on magnetic tape for further processing by another computer, and produce daily logs of rainfall and stream runoff. Because of the relative inaccessibility of the field area, located about five miles from the laboratory, the computer was installed inside the plant area, and data are telemetered to the computer. This auto-mated data acquisition system consisting of a minicomputer with standard and custom interfaces, was designed to acquire data remotely. The individual data recorders on the existing sensors were retained to provide redundancy to ensure that data are gathered even if the computer system

Field 7-RESOURCES DATA

Group 7B-Data Acquition

should fail due to lightning. The automated system provides oniline data acquisition, allowing current data to be always available to scientific investigators. The system also records data on magnetic tape for daily analysis on a larger computer, prints a daily summary of monitored activity, and prints alarm messages announcing any field system mal-functions. (Jones-Wisconsin) W74-07989

APPLICATION OF SATELLITE DATA FOR HYDROLOGIC PURPOSES (ISPOL'ZOVANIYE SPUTNIKOVOY INFORMATSII DLYA GIDROLOGICHESKIKH TSELEY), Gosudarstvennyi Gidrologicheski Institut, Lenin-

grad (USSR).

. V. Kupriyanov, and V. G. Prokacheva. Meteorologiya i Gidrologiya, No 10, p 87-93, October 1973, 2 fig. 16 ref.

Descriptors: *Data collections, *Hydrologic data, *Satellites(Artificial), *Remote sensing, *Photography, Mapping, Hydrography, Snow cover, Ice, Water resources, Water quality. Identifiers: *USSR(Lake Baykal).

Possibilities of utilizing information from artificial earth satellites for hydrologic purposes are examined. TV images from artificial earth satellites are interpreted to study snow cover, ice conditions in lakes, and hydrographic features. Prospects are envisaged for development of methods of interpretation of TV images from artificial earth satellites to solve problems associated with evaluation of water resources, water regime, and water quality. A photograph transmitted from the Apollo-502 spacecraft shows the flood plain of the Senegal River in West Africa (ground resolution is 150 m). Ice conditions in Lake Baykal were mapped by the Meteor-10 artificial earth satellite in January 1973. (Josefson-USGS) W74-08049

AN OSCILLATOR CIRCUIT FOR AUTOMATED SALINITY SENSOR MEASUREMENTS,

Agricultural Research Service, Riverside, Calif. Salinity Lab.

For primary bibliographic entry see Field 2G. W74-08074

7C. Evaluation, Processing and **Publication**

PRECIPITATION CHARACTERISTICS OF THE NORTHERN NEW JERSEY, NEW YORK CITY METROPOLITAN AREA, Rutgers-The State Univ., New Brunswick, N.J.

primary bibliographic entry see Field 2B.

COASTAL VEGETATION OF DELAWARE, Delaware Univ., Newark. Coll. of Marine Studies. For primary bibliographic entry see Field 2L.

WATER RESOURCES DATA FOR NEBRASKA, 1972: PART I. SURFACE-WATER RECORDS, Geological Survey, Lincoln, Nebr. G G Jamison

Basic-Data Report, 1973. 208 p, 2 fig, 3 ref.

Descriptors: *Hydrologic data, *Nebraska, *Surface waters, Streamflow, *Data collections, Descriptors: Stage-discharge relations, Gaging stations, Reser-

The surface-water records for the 1972 water year for gaging stations, partial-record stations, and miscellaneous sites in the State of Nebraska are given. The base data collected at gaging stations consists of records of stage and measurements of discharge of streams or canals, and stage, surface

area, and contents of lakes or reservoirs. In addition, observations of factors affecting the stagedischarge relation or the stage-capacity relation. weather records, and other information are used to supplement base data in determining the daily flow or volume of water in storage. At or near some gaging stations, water-quality records are col-lected. Data are obtained on the chemical quality of the stream water, on water temperature, on suspended-sediment concentration, and on the particle-size distribution of suspended sediment and bed material. (Knapp-USGS) W74-07647

GROUND-WATER LEVELS IN OBSERVATION

WELLS IN KANSAS, 1966-70, Geological Survey, Lawrence, Kans. M. E. Broeker, and J. M. McNellis. Kansas Geological Survey Basic Data Series, Ground-Water Release No 3, 1973. 373 p, 19 fig, 3 tab. 17 ref.

Descriptors: *Water levels, *Kansas, *Water wells, Water table, Groundwater, *Data collections, *Hydrologic data, Water level fluctuations,

Water-level measurements were made in selected wells in 83 counties in Kansas during 1966-70. Water levels in most of Kansas responded primarily to normal seasonal fluctuations in recharge and discharge during 1966-70. However, water levels continued to decline in parts of western Kansas where annual groundwater withdrawals for irrigation plus natural discharge exceed the annual recharge from precipitation. (Knapp-USGS) W74-07650

DATA MANAGEMENT, For primary bibliographic entry see Field 5B. W74-07659

ESTIMATING THE MAGNITUDE OF PEAK DISCHARGES FOR SELECTED FLOOD FREQUENCIES ON SMALL STREAMS IN EAST TEXAS.

Geological Survey, Austin, Tex. For primary bibliographic entry see Field 2E. W74-07664

ANNUAL PEAK DISCHARGES FROM SMALL DRAINAGE AREAS IN MONTANA, THROUGH SEPTEMBER 1972, Geological Survey, Helena, Mont.

For primary bibliographic entry see Field 2E. W74-07667

QUALITY OF SURFACE WATER IN ILLINOIS,

Illinois State Water Survey, Urbana For primary bibliographic entry see Field 5A.

USGS COMPLETES NATIONWIDE RECONNAISSANCE OF METALS IN STREAMS. or primary bibliographic entry see Field 5A. W74-07698

THREE-DIMENSIONAL ZONE MODEL LOG INTERPRETATION, Hawaii Univ., Honolulu. Water Resources

Research Center. For primary bibliographic entry see Field 8G.

OPTIMIZATION OF STOCHASTIC STORAGE MODELS FORMULATED BY P.A.P. MORAN, AND Z. KACZMAREK (OPTYMALIZAEJA STOCHASTYCZNYCH MODELI RETENCJON-

WANIA PODANYCH PRZES P.A.P. MORANA I Z. KACZMARKA),

For primary bibliographic entry see Field 4A. W74-07747

DOCUMENTATION OF PROSPER - A MODEL OF ATMOSPHERE-SOIL-PLANT

PLOW, Oak Ridge National Lab., Tenn. For primary bibliographic entry see Field 2A. W74-07785

SPILLWAY WATER-SURFACE PROFILES, Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab. For primary bibliographic entry see Field 8B. W74-07913

HYDROLOGIC DATA FOR 1972, BROWARD

GOUNTY, FLORIDA, Geological Survey, Tallahassee, Fla. H. W. Bearden.

Open-file report 74005, 1974. 97 p, 42 fig, 5 tab, 16

Descriptors: *Hydrologic data, *Surface-ground-water relationships, *Florida, Aquifiers, Canals, Data collections, Recharge, Water management(Applied).
Identifiers: *Broward County(Fla).

This report is the second of an annual series presenting hydrologic data in Boward County, Florida. The hydrologic data for the 1972 water year are compared with long periods of records from rainfall, groundwater, surface-water, and water-quality stations. The canal network plays an important role in water management in the county. Flow in primary canals is regulated daily to maintain groundwater levels and storage and to provide flood protection. During the wet season, water is discharged from the aquifer to the canal system. During the dry season, water is transported through the canal system from the conservation areas for aquifer recharge. Water-level fluctuations in the aquifer are monitored in 79 wells. A continuous record of stage and discharge is obtained from seven stream-gaging stations in canals. Tidal fluctuations are recorded at 4 stations. Samples are collected semiannually at 27 sites in primary canals. The average annual rainfall in Broward County is 58.46 inches. Rainfall was 62.24 inches during the 1972 water year. Water levels in the aquifer were about average. Flow in levels in the aquifer were about average. Flow in all the major canals except Middle River, Plantation and Snake Creek during the 1972 water year was far below the average. Total coliforms exceeded the permissible limits for Class III waters and waters for public supply in most canals. All public supplies in Broward County are derived from wells in the Biscayne aquifer. During 1972. the seven largest suppliers pumped 29.157 billion gallons, a decrease of 0.227 billion gallons from 1972. (Knapp-USGS) W74-07918

DATA ON FRESH-WATER INFLOW, APRIL 14-JULY 28, 1973, FOR ANALOG-MODEL STUDY
OF THE HOUSTON SHIP CHANNEL,
HOUSTON, TEXAS,
Geological Survey, Houston, Tex.
C. A. Heinrich, and C. E. Ranzau, Jr.

Open-file report, April 1974. 11 p, 2 fig, 4 tab.

Descriptors: *Discharge(Water), *Hydrologic data, Data collections, Streamflow, *Model studies, *Analog models. Identifiers: *Houston Ship Channel(Tex).

Total freshwater inflow from surface channels and from direct precipitation on water surfaces into the Houston Ship Channel and Galveston Bay were determined for a model study of Houston Ship Channel, Houston, Texas. Daily discharges were computed at 14 model discharge stations for the period April 14 to July 28, 1973. The mouth of major tributary to the Houston Ship Channel and Galveston Bay was designated as a model discharge station. Streamflow and rainfall on the stream surface was projected to these stations on the basis of nearby gaged streamflow and measured rainfall. (Knapp-USGS) W74-07921

GROUND-WATER QUALITY MODELS: WHAT THEY CAN AND CANNOT DO. Water Resources Engineers, Inc., Walnut Creek,

Calif For primary bibliographic entry see Field 5B. W74-07933

APPLICATION OF REMOTE SENSING TO HYDROLOGY-FINAL TECHNICAL REPORT, IBM Electronics Systems Center, Huntsville, Ala. For primary bibliographic entry see Field 2A.

QUANTITY AND QUALITY OF SURFACE WATER IN MARION COUNTY, FLORIDA, Geological Survey, Tallahassee, Fla.

W. Anderson, and G. L. Faulkner. Florida Dept. of Natural Resources, (Tallahassee), Bureau of Geology Map Series No 55, 1973. 1 sheet.

Descriptors: *Streamflow, *Surface waters, *Florida, *Water quality, Water balance, Lakes, Springs, Karst hydrology, Discharge(Water), Maps.

Identifiers: Marion County(Fla), Oklawaha River(Fla).

Surface water is abundant around much of the periphery of Marion County, Florida, and along the Oklawaha River, which flows from south to north through the east-central part of the county. Surface water is sparse elsewhere in the county because, with a few exceptions, rainfall infiltrates the sandy soils too rapidly to run off or accumulate in depressions. Thus, only about 25% of Marion County is subject to direct surface drainage, and the remainder is drained through the subsurface. The Floridan aquifer stores the water while transporting it to two major discharge points, Silver Springs and Rainbow Springs, and several lesser discharge points within the county. Nearly all the spring flow leaves Marion County by way of the Oklawaha River, Blue Run, Juniper Creek, and Salt Springs Run. The annual rainfall on Marion County averages 53.2 inches, an average of about 4.1 bgd. About 240 mgd enter the county from the south in the Oklawaha River and a net input of about 440 mgd flows into the county in the Floridan aquifer. Most water in streams in Marion County, and to a lesser degree in lakes, is of the calcium and magnesium bicarbonate type, meaning that the principal dissolved solids in the water come from the limestone and dolomite present in many places near the land surface and which make up the Floridan aquifer. The mineral content of streams in Marion County ranges from 20 mg/liter to more than 400 mg/liter. (Knapp-USGS)

STATE RECORD KEEPING ON WATER AND ITS USAGE AND HYDROLOGIC CALCULA-AND **FORECASTS** (GOSUDARSTVENNYY UCHET VOD I IKH ISPOL'ZOVANIYA I GIDROLOGICHESKIYE RASCHETY I PROGNOZY), Hydrometeorological Service of the USSR,

Moscow

For primary bibliographic entry see Field 7A. W74-08054

NATIONAL WEATHER SERVICE RIVER FORECASTING SYSTEM.

National Oceanic and Atmospheric Administra-tion, Silver Spring, Md. Office of Hydrology. For primary bibliographic entry see Field 4A. W74-08057

8. ENGINEERING WORKS

8A. Structures

THE DESIGN, PLANNING AND CONSTRUCTION OF A 45 INCH DIAMETER WATER MAIN ACROSS A CONGESTED AREA OF WEST BROMWICH.

South Staffordshire Waterworks Co. (England). Distribution Dept.

D. E. Burgess.

Journal of the Institution of Water Engineers, Vol 27, No 7, p 365-376, October, 1973. 3 figs.

Descriptors: *Design criteria, *Project planning, *Sewers, Construction materials, *Steel pipes,

Identifiers: *Pipe bridges, Thrust bores, *United Kingdom(Bromwich).

Described are the design, planning, and construc-tion of a 1145 mm nominal diameter steel water main laid through the County Borough of West Bromwich. The design of the main, which includes pipe bridges over the river Tame and the Walsall Canal, and two thrust bores, is explained and the problems encountered during construction are described. The main was tested in three sections. On completion, of testing the main was drained down and the end connections were then completed. The main was recharged and brought into commission after samples had been chemi-cally tested. (Sanduski-Franklin) W74-07751

A SIMPLE METHOD FOR RETENTION BASIN DESIGN.

Oakland County Drain Commissioner's Office, Pontiac, Mich.

For primary bibliographic entry see Field 5D. W74-07753

SAND CONTROL, (PART 4), COMBINATIONS, COMPARISONS, AND COSTS, Standard Oil Co. of California, Huntington Beach.

Production Office. E. B. Rogers, Jr.

Oil and Gas Journal, Vol 69, No 47, p 64-65, 68, November, 1971. 2 fig, 5 tab, 36 ref.

Descriptors: *Wells, Sands, Fine aggregates, Well filters. *Screens. Epoxy resins, *Adhesives, filters, *Screens, Epoxy resins, *A Coatings, Binders, Economics, *Installation costs.

Identifiers: Chemical-consolidation, *Gravel packs, Sand consolidation, *Sand control.

Several variations, innovations, and combinations of gravel-packing and chemical-consolidation methods of sand control are described. Injectiontime estimates for consolidation processes and rigtime requirements for installation of sand-control devices are presented. The cost of installing sand control varies with the method, zone length, depth of well, and location of well. Economics of screens, gravel-packing, and sand consolidation are compared, as well as the advantages and disadvantages of each. (Staplin-NWWA)

CAUSES AND PREVENTION OF DRILL PIPE TROUBLES.

Armco Steel Corp., Houston, Tex. For primary bibliographic entry see Field 8G. SAND CONTROL IN OIL AND GAS WELLS. PART I, Standard Oil Co. of California, Huntington Beach.

Western Operations Div. For primary bibliographic entry see Field 8B.

SOUTH DAKOTA STANDARDS FOR CONSTRUCTION OF IRRIGATION WELLS IN SHALLOW UNCONSOLIDATED GLACIAL SEDIMENTS,

South Dakota State Univ., Brookings. Inst. of Irrigation Technology. F. F. Kerr, J. L. Wiersma, D. L. Moe, and S. W.

Cooperative Extension Service Circular No 675, 1969. 8 p, 2 tab, 2 append.

Descriptors: *Wells, *Groundwater, *Irrigation wells, *Construction, *Construction materials, Concretes, Screens, Casings, Water quality, Test wells, *South Dakota.

Identifiers: Well development, Well abandonment, *Well construction standards, Glacial sediments. Gravel packs.

These irrigation well standards include many accepted practices and techniques presently in use in South Dakota and in other states, and give contractees and contractors standards to gauge quality of irrigation well construction. Topics include: test drilling; drilling the well hole; well casings, both concrete and metal; well screens, concrete and metal: gravel packs; well development; well sealing and abandonment; chlorination of wells; and determination of water quality. Also, sample forms are included for recording well completion and test pumping data. (Staplin-NWWA) W74-07896

IRRIGATION WELL CONSTRUCTION.

South Dakota State Univ., Brookings. Inst. of Irrigation Technology.

Dept. of Agriculture, Cooperative Extension Service, Publication No FS 411, 1968. 5 p, 3 fig, 2 tab.

Descriptors: Groundwater, Wells, *Construction, *Irrigation wells, *Irrigation design, Casing, Well screens, Water permits, *Well regulations, *Drawdown, Water level, Test wells.

Identifiers: Static water level, Air line, Driller responsibilities, Driller qualifications.

Good irrigation well construction is described. Test hole drilling is necessary to locate a waterbearing formation and to determine the quantity and quality of water available. A gravel-packed well is described and reasons for its use are given. Selecting proper casing and screen diameter is discussed and the use of an air line for measuring static water level and drawdown is described. Legal requirements for drilling, the driller's responsibilities in the design, construction, and development of the well, and the qualifications of a reliable irrigation well driller are also presented. (Staplin-NWWA) W74-07897

SELECTIVE WITHDRAWAL FROM BEECH FORK LAKE, BEECH FORK RIVER, WEST VIRGINIA,

Army Engineer Waterways Experiment Station. Vicksburg, Miss. Hydraulics Lab. For primary bibliographic entry see Field 8B. W74-07914

RECLAMATION RESEARCH IN THE SEVEN-TIES--FIRST PROGRESS REPORT. Bureau of Reclamation, Denver, Colo. For primary bibliographic entry see Field 4A.

Field 8—ENGINEERING WORKS

Group 8A-Structures

PREVENTION OF DAMAGE TO PIPELINES. National Transportation Safety Board, Washing-

ton, D.C. NAVAIIABLE from NTIS, Springfield, Va. 22151, as PB-222 014 Price \$3.75 printed copy; \$1.45 microfiche. Report NTSB-PSS-73-1, June 1973. 32 p, 8 fig, 42 ref, 3 append.

Descriptors: *Pipelines, Damages, *Safety, Construction, *Reviews, Regulation, Legislation.

Identifiers: *Damage control, *Damage prevention.

Prevention of damage to gas and liquid pipelines caused by excavation and construction activities, including blasting, is reviewed. Several recent damage-related pipeline accidents are described, and Federal, State, and industry statistics are provided in order to illustrate the scope of the problem. The damage-prevention responsibilities of excavators, contractors, and pipeline operators are described. Programs, methods, and devices which have proven effective in preventing damage to pipelines are reviewed as are laws and proposed laws in several States and local communities. A model statute issued by the Office of Pipeline Safety of the U.S. Department of Transportation is discussed. (Knapp-USGS) W74-07923

OUTLET WORKS, STILLING BASIN FOR TAL-LAHALA DAM, TALLAHALA CREEK, MISSIS-

Army Engineer Waterways Experiment Station, Vicksburg, Miss.

For primary bibliographic entry see Field 8B. W74-07925

OUTLET WORKS STILLING BASINS, CLIN-TON AND FORT SCOTT DAMS, WAKARUSA AND MARMATON RIVERS, KANSAS, Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.

E. S. Melsheimer.

E. S. Melsheimer. Available from NTIS, Springfield, Va. 22151, as AD-762 553 Price \$3.00 printed copy; \$1.45 microfiche. Technical Report H-73-6, June 1973. 19 p, 7 fig, 15 plate, 11 photo.

Descriptors: *Hydraulic models, *Spillways, *Outlets, Outlet works, Drops(Structures), Gates, Hydraulics, Hydraulic jump, *Kansas. Identifiers: Clinton dam(Kan), Fort Scott dam(Kan).

Model investigations of the outlet works for the Clinton and Fort Scott Dams were used for development of satisfactory stilling basins for a wide range if discharges and tailwater conditions. Of particular interest were low-flow conditions in which the invert of the outlet is submerged by tailwater or in which there is a little drop from the outlet portal invert to tailwater. Both studies were conducted with a 1:16-scale model that reproduced a portion of the outlet conduit, the stilling basin, and about 800 ft of the exit channel. Performances of the original design basins for both projects were unacceptable, as unstable hydraulic action and eddy formation occurred in the basins at or near expected tailwaters with flows less than 1600 cfs. In the case of the Clinton Dam study, decreasing the flare of the outlet transition sidewalls and reducing the elevation of the basin floor (type 15 basin) resulted in adequate, if not ideal, per-formance. Adequate performance of the Fort Scott basin required a decrease in basin width and a reduction in apron elevation (type 7 basin). This basin barely maintained a jump with the design discharge (7370 cfs). Investigation of the 1:5-scale model of the low-flow outlet for the Fort Scott outlet works revealed that the most satisfactory location of the control gate was within and perpendicular to the conduit. With the control gate located at the conduit entrance, the high-velocity tet under the gate was unstable, tending to seal off the conduit at all openings greater than I ft. (Knapp-USGS) W74-07930

INDUCED SAFETY ALGORITHM FOR HYDROLOGIC DESIGN UNDER UNCERTAIN-

TY, Water Resources Center, Budapest (Hungary). For primary bibliographic entry see Field 6A W74-08017

DESIGN AND SIMULATION OF EQUALIZA-TION BASINS,

Environmental Protection Agency, Cincinnati, Ohio. Office of Research and Development. For primary bibliographic entry see Field 5D. W74-08046

8B. Hydraulics

A DERIVATION OF THE HYDRAULIC GEOMETRY OF STEADY-STATE CHANNELS FROM CONSERVATION PRINCIPLES AND SEDIMENT TRANSPORT LAWS, University of Western Ontario, London. Dept. of

Geography.
For primary bibliographic entry see Field 2J.
W74-07633

WELLS AND PUMPING SYSTEMS FOR DOMESTIC WATER SUPPLIES, Illinois State Water Survey, Urbana.

J. P. Gibb.

Circular 117, 1973. 17 p, 8 fig, 1 tab, 10 ref, 2 ap-

Descriptors: *Water wells, *Domestic water, *Illinois, *Groundwater, Water supply, Planning, Water yield, Water quality, Water pollution control, Water treatment, Potable water, Disinfection.

Basic information is presented on wells and pumping systems used for farm and domestic groundwater supplies. Types of wells and their construction, development, and costs are described. Discussed are the various types of pumps and costs. Suggestions on locating wells to prevent pol-lution and procedures for disinfecting a home water supply system are included. (Knapp-USGS) W74-07638 pressure tanks, how to select them, and their

THE NUMERICAL SOLUTION OF TRANSIENT SUPERCRITICAL FLOW BY THE METHOD OF CHARACTERISTICS WITH A TECHNIQUE FOR SIMULATING BORE PROPAGATION, Georgia Inst. of Tech., Atlanta. Environmental

Resources Center

I I Zovne

Available from the National Technical Informa-Available from the National Technical Information Service as PB-232 143, \$12.50 in paper copy, \$1.45 in microfiche. Report No. ERC-0370, May 1970, 165 p, 50 fig, 16 tab, 42 ref, 6 append.

Descriptors: *Supercritical flow, *Unsteady flow, Hydraulic jumps, Open channels, Surges. Identifiers: *Bore propagation, Method of characteristics

Two finite-difference schemes for the solution of unsteady, supercritical flow problems are analyzed and the results are used in proposing a method to simulate bore propagation in supercritical flow. Two nonlinear one-dimensional partialdifferential equations are written for a rectangular cross section including only the gravity and friction forces. The equations are solved by employ-ing two finite-difference schemes programmed on a digital computer. In the Characteristics Grid scheme, the equations are integrated along curves which results in an uneven distribution of grid points. In the Fixed Grid scheme, the flow qua ties at a point on a characteristic are determined by interpolation from a fixed spatial grid. Although

the Characteristics Grid method may be more accurate and efficient, the difficulties involved in programming do not recommend its general use; and therefore, the Fixed Grid method is the better method for supercritical flow simulation. A bore may be simulated in supercritical flow by employin conjunction with Fixed Grid method the well-known sequent depth equation for hydraulic well-known sequent depth equation for hydraulic jumps. The numerical scheme adequately simu-lates the propagation of experimental bores without the necessity of using special finite-dif-ference equations in the vicinity of the bore front. Solution of multi-channel problems in sub-and/or supercritical flow is therefore feasible. (See also W71-10174) (James-Georgia Tech)

HYDRAULICS OF CULVERT OUTLETS,

Auckland Univ., (New Zealand). Dept. of Civil Engineering. R. A. Callander.

New Zealand Engineering, p 261-265, September 15, 1973. 5 fig, 3 ref.

Descriptors: *Jets, *Culverts, Data collections, *Design criteria, Energy dissipation, Settling basins, *Outlets, *Mathematical studies, basins, *Outlets, *Mannings equation. Identifiers: Jet spreading.

Spreading of a jet from a culvert outlet is analyzed to yield depth, breadth, and velocity in terms of distance from the outlet, with the subsequent solution being presented in the form of design charts. tion being presented in the form of design charts. These data facilitate design of a stilling basin to dissipate excess energy, and selection to prevent scour. For the latter purpose, the Manning-Strickler formula is used with the Shields criterion for stability. (Sanduski-Franklin) W74-07749

TEST RESULTS ON BUOYANT JETS IN-JECTED HORIZONTALLY IN A CROSS FLOW-ING STREAM,

American Univ., Beirut (Lebanon). Faculty of Engineering and Architecture. G. M. Ayoub.

Water, Air, and Soil Pollution, Vol 2, No 4, p 409-426, December 1973. 12 fig, 1 tab, 5 ref.

Descriptors: *Simulation analysis, Investigations, *Turbulent flow, *Currents(Water), *Jets, Distribution patterns, *Mathematical studies. Identifiers: Concentration distribution, Maximum concentration. Concentration dilution

The behavior was studied of axi-symmetric turbulent buoyant jets injected horizontally in a cross flowing current. Material concentration profiles were measured across various sections along jets of different parametric values. From these profiles, concentration distribution curves as well as maximum concentration and dilution values and as maximum concentration and unution values and their variation with distance along the jet were determined. Half jet radius values were calculated to study the expansion of the jet. Jet boundaries and trajectories were studied photographically and compared with measured values. The effect of the ambient current on the overall shape of the jet was established by the study of the measured complete concentration section across the jet. (Sandoski-W74-07766

HYDROLOGY AND STRUCTURAL DESIGN (IN

A. I. Chebotaryov, and B. I. Serpik Meteorologiya i Gidrologiya, No 10, p 45-54, 1973. 3 fig, 5 ref. English summary

Descriptors: Reviews, Documentation, *Hydrologic aspects, *Structural design, *Design criteria, *Mathematical studies, *River flow, Descriptors: Standards Identifiers: Errors.

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Hydraulics-Group 8B

A summary of the Guide to Determination of Design Hydrological Characteristics is given. Errors made in the preparation of certain normative documents are mentioned and immediate tasks are shown, the solution of which should improve technical norms in the field of calculations of river flow as applied to the requirements of structural design. (Sandoski-Franklin) W74-07767

THE DISPERSION OF CONTINUOUSLY IN-JECTED EFFLUENTS IN OPEN CHANNELS, Louisiana State Univ., Baton Rouge. Resources Research Inst.
For primary bibliographic entry see Field 5B.
W74-07833

SAND CONTROL, (PART 4), COMBINATIONS, COMPARISONS, AND COSTS, Standard Oil Co. of California, Huntington Beach. Production Office. For primary bibliographic entry see Field 8A. W74-07851

RECENT ADVANCES IN LOG EVALUATION, Schlumberger, Well Surveying Corp., Paris For primary bibliographic entry see Field 8G. W74-07853

TRACERS IN MUD IMPROVE DST, WIRELINE TEST ACCURACY, Chevron Oil Co., Denver, Colo. For primary bibliographic entry see Field 8G. W74-07856

LOCATION AND CHARACTERISTICS OF THE INTERFACE BETWEEN BRINE AND FRESH WATER FROM GEOPHYSICAL LOGS OF BOREHOLES IN THE UPPER BRAZOS RIVER BASIN, TEXAS,

Geological Survey, Denver, Colo. W. S. Keys, and L. M. MacCary. Professional Paper 809-B, 1973. 23 p, 13 fig, 1 tab, 11 ref.

Descriptors: Wells, *Test wells, *Groundwater, *Borehole geophysics, *Logging(Recording), Resistivity, Electrical well logging, Radioactive well *Salinity. logging, *Texas. Geology, Water quality,

Identifiers: Neutron logs, Natural-gamma logs, Caliper logs, Brazos River Basin(Tex), Brine seeps.

Borehole geophysics was used during a testdrilling program in the upper Brazos River basin to determine the location, characteristics, and relation to lithology of an interface between brine and overlying fresh to slightly saline water. The analysis of several different types of geophysical well logs enabled the accurate location of the interface, proved that it was quite sharp, and showed that the interface was not related to lithology in most places. Single-point-resistance and spontaneouspotential logs were responsive to the interface in many open holes, whereas the neutron-epithermalneutron and neutron-gamma log combination could be used to find the interface behind well casing. Caliper logs were used to locate fracture zones, which contained brine in some areas and zones, which contained brine in some areas and gas in others. All of these logs along with the natural gamma were used to identify and correlate the lithologic units penetrated by the test holes. (Staplin-NWWA) W74-07859

DISSOLUTION OF A POROUS MATRIX BY A SLOWLY REACTING ACID, Fluor Corp. Ltd., Houston, Tex. W. E. Sinex, Jr., R. S. Schechter, and I. H. Silberberg.

Industrial Engineering Chemical Fundamentals, Vol 11, No 2, p 205-209, May, 1972, 4 fig, 10 ref.

Descriptors: *Wells, *Productivity, *Acids, Chemical reactions, Porous media, Porosity, Permeability. Identifiers: *Well stimulation, *Acidization,

Hydrochloric acid, Hydrofluoric acid, Slow reac-

The acid treatment of a well to increase its productivity is commonly practiced; however, at the present time there is no proven method to guide the design of such a process. This research examines the ability of a previously proposed model to predict the changes in a porous matrix when invaded by a slowly reactive fluid which dissolves a portion of the solid. The model is shown to predict a relationship between the increase in porosity and the permeability which is not precisely unique, as epends to some extent on the initial pore size distribution, but for the initial distributions tested the permeabilities were found to lie in a narrow These results are independent of any parameters defining the kinetics except that the reaction be slow. It is shown experimentally that the reaction of ferric citrate in the presence of citric acid with porous bronze disks satisfies the condition of being a slow reaction. The permeability change of the porous bronze disks is found to agree closely with the theoretical predictions. (Staplin-NWWA) W74-07860

DRILL PIPE FAILURES: WHERE DO WE GO FROM HERE, Continental Oil Co., Ponca City, Okla.

For primary bibliographic entry see Field 8G. W74-07869

WAYS TO IMPROVE YOUR WELL COMPLETIONS, Institut Français du Petrole, Rueil-Malmaison (France) For primary bibliographic entry see Field 8G. W74-07870

EFFECT OF BENTONITIC FLUID PROPERTIES ON DRILLING RATE. Texas Univ., Austin. B. Evans, and K. E. Gray.

Journal of Petroleum Technology, Vol 24, No 6, p 657-662, June 1972. 8 fig, 13 ref.

Descriptors: *Drilling, *Bentonite, *Drilling fluids, Mud, Viscosity, Permeability, Filtration, Laboratory tests, Pressure, Slurries, Sandstone, Limestone.

Identifiers: *Drilling rate, *Microbit drilling, Dif-ferential pressure, Kinematic viscosity, Berea sandstone, Lueders limestone.

Bentonite suspensions and water were used in a laboratory study of the effect on drilling rate of kinematic viscosity, filtration rate, pressure gradient, permeability reduction beneath the bit, solids concentration and sensitivity of the formation to water. Berea sandstone and Lueders limestone were drilled with a two-cone 1 1/4-inch diameter bit under controlled conditions. Drilling rates in both Berea sandstone and Lueders limestone decreased as bentonite concentration increased from 0.5 to 4.0% by weight, except at 1% concentration. Drilling rate with 1% bentonite suspension was higher than with water alone. Pressure gradients immediately beneath the bit increased as bentonite concentration increased, except for the 1% suspension. Filtration rate and kinematic viscosity were found to have effects on drilling rate but did not independently control it. NWWA) W74-07879

WATER JET CUTTING OF SEDIMENTARY Missouri Univ., Rolla

D. A. Summers, and R. L. Henry. Journal of Petroleum Technology, Vol 24, No 7, p 797-802, July, 1972. 9 fig, 3 tab, 11 ref.

Descriptors: *Jets, *Drilling, *Sedimentary rocks, Rock excavation, Drilling equipment, *Sandstone, *Limestone, Rock properties, Statistical methods, Nozzles.

Identifiers: *Water jets, Specific energy of cutting, Rock cutting, Berea sandstone, Indiana limestone, Jet kinetic energy.

A laboratory study was made of the cutting of Berea sandstone and Indiana limestone by a water jet at various traverse speeds at jet pressures of 5000 to 30,000 psi. The specific energy of breakage was calculated. Results showed that at slower traverse speeds the cutting efficiency dropped sharply as jet pressure increased but as the traverse speed increased the efficiency rose and in some instances the high-pressure jets became more efficient than the lower pressure jets. Two concepts in water-jet tools are: (1) rotating jets to remove all of the rock at the face, or (2) cutting slots with the water jet and then removing the ribs of rock by mechanical means. Calculations showed that there was a fifteen-fold gain in effireiency of cutting by the use of the second method.

Pump size could be reduced by employing mechanical breakers to remove the ribs remaining after slots had been cut by the water jet. (Campbell-NWWA)

SAND CONTROL IN OIL AND GAS WELLS, PART I.

Standard Oil Co. of California, Huntington Beach. Western Operations Div.

E. B. Rogers, Jr. Oil and Gas Journal, Vol 69, No 44, p 54-60, November, 1971. 9 fig, 2 tab, 36 ref.

Descriptors: *Wells, *Ground water, *Sand, Well filters. Fine appregates. Particle size, *Well filters, Fine aggregates, Particle size,

screens. Identifiers: Wentworth scale, *Gravel packs, *Sand control.

Operating costs multiply when sand production wears out equipment and forces expensive workovers. A series of laboratory experiments shows: sand breaks away from an unsupported formation face either as individual particles, as sloughing masses, or in a fluidized state; interfacial tension acts as a strong cohesive force between sand grains if two phases are present around grain contacts; introducing water into a rising column of oil and suspended sand grains causes the sand grains to form aggregates (bound by a film of water) that drop cut of the flow stream. Sand-control methods divide into two main categories -- bridging of the sand, and consideration of the sand in place. The bridging methods for sand control use either screens or gravel packs, and require a knowledge of the formation size distribution. Sieve analysis necessary to obtain this information, and precedes specification of the size and nature of material to be included in the gravel pack. (Staplin-NWWA)

SOLVING DRILLING PROBLEMS UTILIZING WELL LOGS - A CASE HISTORY, Continental Oil Co., Houston, Tex.

For primary bibliographic entry see Field 8G.

SPILLWAY WATER-SURFACE PROFILES,

Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab. R. G. Cox.

Available from NTIS, Springfield, Va. 22151, AD-762 128, Price \$3.00 printed copy; \$1.45

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Group 8B-Hydraulics

microfiche. Miscellaneous Paper H-73-4, June 1973. 7 p, 13 plate, 4 tab.

Descriptors: *Spillways, *Computer programs, *Stage discharge relations, *Profiles, Hydraulics, Spillway crests, Discharge(Water), Outlet works.

A computer program transfers Bureau of Reclamation upper wateh-surface profile coordinates into terms required for Corps of Engineers design practices. Equations were developed to show the relation between WES profiles for heads of 0.5, 1.0, and 1.33 times the design head. The procedure for design neads is applicable to spillways of varying hei heights and upstream face slopes. (Knapp-W74-07913

SELECTIVE WITHDRAWAL FROM BEECH FORK LAKE, BEECH FORK RIVER, WEST VIRGINIA.

VIRGINIA, Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab. T. L. Gloriod, and J. P. Bohan. Available from NTIS, Springfield, Va. 22151, AD-768 777, Price \$3.00 printed copy; \$1.45 microfiche. Technical Report H-73-14, September 1973. 14 p, 8 fig, 19 plate, 1 tab, 7 ref.

Descriptors: *Stratified flow, *Density currents, Hydraulic models, Reservoir operation, *Reservoir releases, *West Virginia, Stratifica-tion, Density stratification, *Withdrawal. Identifiers: Beech Fork Lake(W Va).

Tests were conducted on a 1:36-scale model of a portion of the proposed Beech Fork Lake and multilevel intake structure to determine the effects of the upstream topography and the geometry in the vicinity of the intake structure on the selective withdrawal capability of the structure. Density stratification caused by differentials in temperature in the prototype was simulated in the model by using saline and fresh waters. Density profiles, appropriate discharges, and other required data were used as input to a computer program based on the selective withdrawal techniques developed in previous investigations to predict the withdrawal-zone limits. Based on selective withdrawal performance, there appeared to be no distinct difference in the three locations tested. One test was conducted with a dyed, dense inflow. An equal rate of withdrawal was released through the lowest level intake to determine the path of the inflow through the lake. The flow followed the sinuous river channel from the point of entry to the intake structure. The dyed inflow then remained in the river channel until there was enough buildup for it to enter the approach channel. Density currents were not affected by either the topography of the reservoir and approach channel or the geometry in the immediate vicinity of the intake structure. (Knapp-USGS)

OUTLET WORKS, STILLING BASIN FOR TAL-LAHALA DAM, TALLAHALA CREEK, MISSIS-

SIPPI, Army Engineer Waterways Experiment Station, Vicksburg, Miss.

Vicksburg, Miss.
N. R. Oswalt.
Available from NTIS, Springfield, Va 22151, as AD-759 905, Price \$3.00 printed copy; \$1.45 microfiche. Technical Report H-73-5, April 1973. 21 p, 2 fig, 5 plate, 4 photo, 1 tab.

Descriptors: *Spillways, *Outlet works, Settling basins, Eddies, Turbulence, Drops(Structures), *Mississippi, Hydraulic structures. Identifiers: *Stilling basins, Tallahala Dam(Miss).

Tests were conducted on a 1:16.6-scale model of the Tallahala Creek, Mississippi, outlet works stilling basin to determine if eddies or other un-desirable flow conditions would exist in the stilling basin. The basin consisted of a horizontal apron 90 ft long and 22 ft wide and was connected to the 10ft-diam outlet by a 56-ft-long transition with sidewalls flared 8.67 on 1. Eddies occurred in the original design basin with discharges of 800 cfs or less and the expected tailwater elevations. The ed-dies were eliminated by revising the floor and walls of the flared transition. The sidewall flare was changed from 8.67 on 1 to 11.83 on 1 and the was changed to a IV-on-8H downsloping floor was changed to a IV-on-6H upslope for a rise of 4 ft and then a downslope. The floor was sloped down laterally 1 ft from the transition center line to each wall.

Spray off of the baffle blocks occurred with the design discharge and minimum tailwater with the stilling basin as originally designed. The height of the baffle blocks was increased and an additional row of blocks was added to prevent this type of action. (Knapp-USGS) W74-07925

OUTLET WORKS STILLING BASINS, CLINTON AND FORT SCOTT DAMS, WAKARUSA AND MARMATON RIVERS, KANSAS, Army Engineer Waterways Experiment Station, Vicksburg, Miss. Hydraulics Lab.

For primary bibliographic entry see Field 8A.

TWO NEW DRILLING SYSTEMS PASS INI-THAL FIELD TESTS, DC ELECTRIC POWER SWIVEL CAN SAVE TIME AND MONEY; HYDRAULIC SNUBBER BUILT TO OPERATE IN RUGGED TERRAIN.

For primary bibliographic entry see Field 8G. W74-07980

FLOATING BREAKWATER FOR ATTENUAT-ING SEAS.

Debero Kogyo Co. Ltd., Mito (Japan). (assignee) M. Tachii.

U.S. Patent No. 3,791,150, 3 p, 5 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 919, No 2, p 459, February 12, 1974.

Descriptors: *Patents, *Shore protection, *Ocean *Breakwaters, Barriers, Equipment, Floats.

The floating breakwater has two or more expanding portions which are enlarged in turn from the front to the rear of the body. The portions are continuously engaged through concave portions in a sine wave shape in such a manner that not only the heights of the waves but the wavelengths of the expanded portions are in turn enlarged from the front to the rear of the body. The outer layers may preferably be formed of synthetic resin. Floating material such as foam synthetic resin is filled into the floated portion, and liquid such as sea water is filled into the bottom side under water through a supply port. (Sinha-OEIS) W74-08043

LOW-INDUCED VIBRATION OF VERTICAL-LIFT GATE, Imperial Coll. of Science and Technology, London

(England). Dept. of Civil Engineering. For primary bibliographic entry see Field 8C. W74-08058

8C. Hydraulic Machinery

THE SNODLAND-IGHTHAM REGIONAL DRAINAGE SCHEME: DESIGN AND OPERA-

For primary bibliographic entry see Field 5D. W74-07752

AUTOMATION OF THE CONTROL AND OPERATION OF WATER POLLUTION CON-Norwich Sewage Treatment Works (England).

For primary bibliographic entry see Field 5D. W74-07758

DESIGN DATA AND SAFETY FEATURES OF COMMERCIAL NUCLEAR POWER PLANTS, VOI I

Oak Ridge National Lab., Tenn. Nuclear Safety Information Center. For primary bibliographic entry see Field 5G.

DESIGN DATA AND SAFETY FEATURES OF COMMERCIAL NUCLEAR POWER PLANTS,

Oak Ridge National Lab., Tenn. Nuclear Safety Information Center. For primary bibliographic entry see Field 5G. W74-07795

DESIGN DATA AND SAFETY FEATURES OF COMMERCIAL NUCLEAR POWER PLANTS, VOL. III.

Oak Ridge National Lab., Tenn. Nuclear Safety Information Center.
For primary bibliographic entry see Field 5G.

AUTOMATIC PUMPING INSTALLATIONS FOR

AUTOMATIC PUMPING INSTALLATIONS FOR LIVESTOCK SECTIONS, Y. Y. Goryacheva, and S. V. Ryzhov. Typescript 17 p. (Translating agency not cited). Translated from Gidrotekhnika i melioratsia, No. 10, October 1972.

Descriptors: Groundwater, *Wells, *Pumps, Jets, Turbines, Economics, Irrigation, *Livestock, Stock water, *Automatic control, *Water supply, Stock water, Automation, Costs. *USSR,

Submersible Peripheral turbines, Regenerative turbines.

The technical and economic characteristics of livestock water supply systems incorporating au-tomatic water-lifting installations in the U.S.S.R. are discussed. The various components of the installations are described: water lifter, hydropneumatic tank, pressure relay, electrical control box, safety valve, and pressure gauge. These installa-tions are of three general types: those with jetpump lifters, those with peripheral -- or regenera-tive -- turbine pumps, and those with submersible electric pumps. Systems design and operation are emphasized. (Campbell-NWWA) W74-07864

VALVE INSTALLATION, OPERATION AND MAINTENANCE,

Chemical Engineering, Vol 78, No 23, p 141-149, October 1971. 10 fig, 1 tab, 3 ref.

Descriptors: *Valves, *Operation and maintenance, *Maintenance costs, *Installation. Identifiers: Ball valves, Plug valves, Globe valves, Gate valves, Check valves, Butterfly valves, Orings, Gaskets, Seals, Liners PTFE materials.

Valve repairs are best done out of the pipeline, although in-line replacement of PTFE parts and some metal parts will produce satisfactory results on some valve types. The remachining necessary on metal globe, gate and check valves requires adequate equipment and know-how on the part of the shop personnel. Most operating plants would not be justified in attempting such repairs them-selves, and specialists should be considered for this type of work. Installation of seat seals, new metal parts, liners and other miscellaneous parts might be done either in-plant, or in a valve repair shop. Valve repair is generally considered shop. Valve repair is generally considered economic if the unit can be reconditioned for no more than 65% of the replacement cost. Repair costs average close to 50% of the replacement

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cost; however, many valves are not repairable because of exceeding the cost criterion above.
Generally a valve is not repairable if the body cannot be reused, as cost of repair will exceed the value recoverable. (Campbell-NWWA) W74-07867

PUMP SELECTION.

Brown and Root, Inc., Houston, Tex. W. H. Stindt. Chemical Engineering, Vol 78, No 23, p 43-49, October 1971. 9 fig, 7 ref.

Descriptors: *Pumps, Hydraulics, *Head loss, *Pressure head, Costs, *Capital costs, *Operating costs

Positive-displacement Reciprocating pumps, Static head, Velocity head, Suction lift, Net positive suction head.

Pump selection requires a careful analysis of the hydraulic system and the pump's location and function within the system. Hydraulic factors discussed include pressure, head, static head, velocity head, suction lift, total discharge head, total head, head losses, and NPSH (net positive suction head). Means of calculating head curves and NPSH requirements are given. Handling of entrained gases, viscous fluids, and slurries is also discussed. Pump classifications and questions of pump function and installation relevant to pump selection are discussed. Positive-displacement pumps and reciprocating pumps are considered in some detail. Finally, economic factors including capital and operating costs are considered as a part of final pump evaluation procedures. (Staplin-NWWA) W74-07872

PUMP INSTALLATION AND MAINTENANCE, Union Carbide Corp., South Charleston, W. Va. Chemicals and Plastics. J. A. Reynolds.

Chemical Engineering, Vol 78, No 23, p 67-76, October 1971. 8 fig, 2 tab, 2 ref.

Descriptors: *Pumps, *Maintenance, Operations, Installation, Pipes.

Identifiers: *Pulsation dampeners, Suction piping, Pipe loading, *Pressure relief, Trouble shooting.

Much of the effort devoted to careful selection and sizing of a process pump may be wasted if the unit is not installed and maintained properly. A unit is not installed and maintained properly. A pump installation check list prescribes a substantial foundation for pump support, a level base plate, proper coupling alignment, even flow through suction piping, little pipe loading, checking direction of rotation, and final alignment after pump has run long enough for temperatures to stabilize. Also discussed are pressure relief devices, vents and drains, pulsation dampeners, catch basins and shield, and startup and trouble shooting procedures. (Campbell-NWWA) W74-07873

POSITIVE DISPLACEMENT PUMPS.

Dynamic Technology, Inc. M. Glickman. Chemical Engineering, Vol 78, No 23, p 37-42, October 1971. 11 fig. 7 ref.

Descriptors: *Pumps, Operations, Flow, *Flow

Descriptors.
characteristics.
*Positive-displacement Identifiers: *Positive-displacement pumps, *Volumetric efficiency, Metering pumps, Vacuum pumps, Vane pumps, Rotary pumps, Diaphragm

The primary characteristic of positive displacement pumps is that they exhibit a direct relation-ship between the motion of the pumping elements and the quantity of liquid moved. Positive dis-placement pumps have a dynamic seal (sliding or rotating) that separates the discharge fluid from the inlet or suction side. Liquid displacement is theoretically equal to the swept volume of the pumping element. Flow rate is determined by the pumping element. Flow rate is determined by the speed of the pumping element and is independent of pressure. In actual practice, however, pressure of leakage through the dynamic seals, which is proportional to the pressure gradient. Actual flow divided by ideal flow is volumetric efficiency, a basic characteristic of positive displacement pumps. Volumetric officiency states from the the 50% units. ric efficiency can range from less than 50% up to 98%. Metering pumps, vacuum pumps, vane pumps, rotary pumps, and diaphragm pumps are discussed; their specific applications and operat-ing characteristics are identified. (Staplin-NWWA) W74-07874

DOWN-HOLE MOTORS FOR IMPROVED

DRILLING,
Dyna-Drill Co., Houston, Tex.
B. J. Roberts, and C. H. Mohr. Journal of Petroleum Technology, Vol 24, No 12, p 1484-1490, December 1972. 3 tab, 5 ref.

Descriptors: *Turbines, *Drilling, *Drilling equipment, Drilling fluids, Boreholes, Wells, Temperature, Hydraulics, Pumps, Drilling fluid, Mud,

Identifiers: *Down-hole motors, *Diamond bits, Drill-string stabilization, Drilling cost.

The performance record for a down-hole motor and diamond bit in drilling the Wolfcamp formation in West Texas is given. From this study, conclusions are drawn as to the applicability of the down-hole motor in straight-hole drilling. The formation to be drilled must be suitable to the use of diamond bits. Shales (free of chert, pyrite and quartzite), dolomites, some limestones and some sandstones are 'diamond drillable.' The hydraulic system of the drilling rig must provide flow and pressure characteristics that will permit optimum performance of the motor. The pressure drops needed to operate various down-hole motors range from 250 to 1000 psi. The circulating rate necessary to power the bit depends on the size of the tool. For positive displacement motors the range is 160 to 450 gal. per min. A pressure drop of about 400 psi across the bit is a practical value. The downhole environment must be such as to permit the economical operation of the down-hole motor. Temperature must be less than 300 degrees F. Rubber components of the down-hole motor may e adversely affected by certain oils in the drilling fluid, by abrasive substances, and by high pressure gas. Lost-circulation materials may plug the tool. Diamond bits used with down-hole motors should be specifically designed for this purpose. Stabilization of the string is a key requirement in the economic use of down-hole motors. Intangible savings result from slower rotation and fewer trips when using down-hole motors and diamond bits. (Gray-NWWA) W74-07880

WATER JET CUTTING OF SEDIMENTARY

Missouri Univ., Rolla. For primary bibliographic entry see Field 8B. W74-07883

SOUTH DAKOTA STANDARDS FOR IRRIGA-TION PUMPS AND POWER UNITS, South Dakota State Univ., Brookings. Inst. of Ir-

rigation Technology.
S. W. Black, and W. H. Peterson.
Cooperative Extension Service Circular No 676, 1969. 12 p, 6 fig, 1 tab.

Descriptors: *Pumps, *Electric motors, *Centrifugal pumps, *Turbines, Hydraulic equipment, *Safety, *South Dakota. Identifiers: Propeller pumps, Pump standards, *Power unit standards, Internal combustion entitle New Academic Standards, Total dynamics. New Academic section band. Total dynamics.

gine, Net positive suction head, Total dynamic suction lift.

These pump and power unit standards as set forth include many accepted practices and techniques presently used in South Dakota and in other states ere irrigation is practiced extensively. Topics include: turbine pumps, centrifugal pumps, propeller pumps; electric motors and internal combustion engines as power unit alternatives; instal-lation standards, including preliminary operation and adjustment, information from suppliers, general provisions for all installations, and special provisions for electrical installations; and safety guidelines. A table of definitions of hydraulic terms and devices is included. (Staplin-NWWA)

IMPROVED DRILLING RATES AT LOWER

New South Wales Univ., Broken Hill (Australia). V. S. Vutukuri.

Mining Magazine, Vol 125, No 4, p 324, 327, October, 1971. 1 tab, 19 ref.

Descriptors: *Rotary drilling, *Drilling fluids, *Surfactants, *Cost analysis, Electrolytes, Drilling, Rock properties.

Identifiers: Specific energy, Drilling rate, Sodium carbonate, Rock carbonate, Rock hardness, Bit wear, Rock strength.

Several publications on the subject of the effect of some electrolytes and surfaceactive agents on the drilling strength of rock are reviewed. Cost of drilling, the ultimate measure of efficiency, depends upon the energy required to break a unit volume of rock, the speed of drilling, and the bit wear. Reduction in rock strength lowers the energy requirement, or, if power applied is kept con-stant increases the rate of penetration. A decrease or an increase in the hardness of the bit may occur. Depending upon the predominating factors, the total effect of additives on drilling costs may be positive or negative. A decrease of about 10% in the compressive and the tensile strengths of sandstone and limestone was observed when specimens were saturated with a solution of 8% sodium carbonate as compared to water-saturated samples. Improvement in drilling rate can be brought about by the addition to water of small amounts of electrolytes, polar liquids, and soaps. (Gray-NWWA) W74-07901

APPLICATION OF ELECTRICAL ENERGY TO CULVERT ICING PROBLEMS--A LABORATO-RY STUDY,

Cold Regions Research and Engineering Lab. Hanover, N.H.

D. A. Gaskin, and L. E. Stanley. Technical Report 248, March 1974. 43 p, 17 fig, 7 tab, 6 ref, 7 append.

Descriptors: *Ice, *Melting, *Culverts, *Deicers, Heating, Thawing, Snow removal, Highways. Identifiers: *Culvert deicing.

The use of electric heat cables to counteract culvert icing was tested. An 80-in-long, 1-ft-diam cul-vert with a 10-ft copper sheath heating cable modeled a typical Alaskan installation. Tests were made to evaluate several continuous power levels, a short-term percentage timer, and the automatic system. Maximum efficiency (cross section produced per unit energy input) occurred when the cable was operated continuously at its maximum permissible power level. The short-term timer system was less efficient than applying the same amount of energy continuously. The automatic system performed well in the laboratory, but may system performed well in the laboratory, out may need additional design work to ensure reliability in field applications. The major heat transfer mechanism is convection. Marked constrictions in tunnel size were observed at the ice/air interfaces. These observations imply that the cable should be installed near the bottom of the culvert and the end risers doubled or tripled. The continuous operation mode is the most reliable, but the most expensive

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of the systems tested. The pulsed system was less expensive. The automatic system was the least expensive. (Knapp-USGS)
W74-07909

ENERGY PRODUCTION. Omaha Public Power District, Nebr. For primary bibliographic entry see Field 6D. W74-07967

REGIONAL. ENERGY-WATER PROBLEMS NORTHEAST.

Delaware Univ., Newark. Water Resources Center.

For primary bibliographic entry see Field 6D.

W74-07971

REGIONAL ENERGY-WATER PROBLEMS, PACIFIC NORTHWEST, North Dakota State Univ., Fargo. Water

Resources Research Inst. For primary bibliographic entry see Field 6D.

FLOW-INDUCED VIBRATION OF VERTICAL-LIFT GATE.

Imperial Coll. of Science and Technology, London (England). Dept. of Civil Engineering. J. D. Hardwick

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 100, No HY5, Paper 10546, p 631-644, May 1974. 17 fig, 18 ref.

Descriptors: *Gates, *Hydraulics, *Vibrations, Jets, Hydraulic models, Hydraulic design, Hydrodynamics, Turbulence.

The vibration of a vertical-lift gate with a flat bottom and a single vertical degree-of-freedom was studied experimentally in a scale model. The vibra-tion is due to a periodic reattachment of the jet to the bottom of the gate. The exciting force and the unsteady flow pattern was correlated. Negative damping was measured directly and is a function of flow velocity and vibration amplitude. The nonlinear response of the system is related to interactions between the exciting force and the motion of the gate. (Knapp-USGS) W74-08058

8D. Soil Mechanics

LIME GROUT PENETRATION AND SOCIATED MOISTURE MOVEMENTS IN SOIL, Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia), Div. of Ap-

Died Geomechanics.
O. G. Ingles, and R. C. Neil.
In: Proceedings of the Symposium on Soils and Earth Structures in Arid Climates, May 21-22, 1970, Adelaide, Australia, p 37-41, (1970). 1 fig, 2 tab, 13 ref.

Descriptors: *Grouting, Soil properties, types, Soil moisture, Permeability, *Soil stabiliza-tion, *Stabilization, Soil mechanics, *Soil physical

Identifiers: *Lime grout penetration, Depth of stabilization, Drill-lime, Deep stabilization.

The use of lime, placed or injected, for deep soil stabilization has been a matter of controversy. To permit a rational assessment of this process for design purposes, a series of field experiments were made. These experiments were chosen to determine whether diverse soils subject to intermittent severe drying and occasional flooding might be stabilized by a lime grouting process, and if so, what design procedures would be required. The results show that fissuring of the soil and the moisture associated with the grout are major parameters for practical purposes, and their implications for practical application of drill-lime and lime grout injection processes have been critically evaluated. (Martino-NWWA) W74-07871

THE SIGNIFICANCE OF MOISTURE FLOW AND EQUILIBRIA IN UNSATURATED SOILS IN RELATION TO THE DESIGN OF EN-GINEERING STRUCTURES BUILT ON SHAL-LOW FOUNDATIONS IN AUSTRALIA,

Commonwealth Scientific Industrial Research Organization, Syndal (Australia), Soil Mechanics Section. B. G. Richards

Presented at Symposium on Permeability and Capillarity, American Society for Testing and Materials, June 26-July 1, 1966, Atlantic City, New Jersey, 28 p, 13 fig, 2 tab, 40 ref.

Descriptors: *Soil water movement. Moisture. *Soil moisture, Permeability, Soil stability, Foundation, *Foundation investigations, *Australia, Structural design.

Identifiers: *Moisture flow, *Moisture equilibri-um, Foundation design, Undersaturated soil, Moisture retention.

A broad-scale investigation of moisture conditions in pavement subgrades in Australia was undertaken to define the moisture movement and equilibria in undersaturated clay soil. Concurrently, a number of investigations were carried out on moisture equilibria under houses and slab floors of large industrial buildings. The results of these investigations were used to produce a design technique for the foundation of structures founded at shallow depths. This technique has been used as a guide in the design of buildings on flat slabs in the vicinity of Melbourne, but it has not been tested adequately at this time. Techniques for measuring the necessary soil properties are given. (Martino-NWWA) W74-07899

SUBSURFACE EXPLORATION AND SAM-PLING OF SOILS FOR CIVIL ENGINEERING PURPOSES,

Army Engineers, Waterways Experiment Station, Vicksburg, Miss.

Report on a Research Project of the Committee on Sampling and Testing, Soil Mechanics and Foundations Division, American Society of Civil Engineers, 1948. 465 p, 357 fig, 13 tab, 986 ref, 1 ap-

Descriptors: *Soil types, Soil structure, *Soil surveys, Soil properties, *Soil mechanics, Soil analy-*Subsurface investigations, *Sampling, Civil engineering, *Reviews.

Identifiers: Ocean-bottom exploration, Mineral exploration, Piston samplers, Open drive samplers, Penetration resistance drive samplers.

A review is presented of the requirements, general procedures, and various methods of subsurface exploration and sampling. A series of summary directions for the design of sampling equipment and for sampling operations and handling of samples has been formulated, including a fairly detailed description of the equipment and methods used in obtaining samples of subsurface materials and in the preservation and handling of these samples. Also presented is a review of the principal sampling methods and equipment used in oceanbottom exploration and in search for oil and minerals. The advantages and disadvantages of the various methods and types of equipment for boring and sampling are discussed in relation to the soil conditions. (Campbell-NWWA) W74-07905

8E. Rock Mechanics and Geology

THE SIGNIFICANCE OF MOISTURE FLOW AND EQUILIBRIA IN UNSATURATED SOILS IN RELATION TO THE DESIGN OF EN-GINEERING STRUCTURES BUILT ON SHAL-LOW FOUNDATIONS IN AUSTRALIA, Commonwealth Scientific Industrial Research Or-

ganization, Syndal (Australia). Soil Mechanics Section.

For primary bibliographic entry see Field 8D. W74-07899

POROSITY-RESISTIVITY CROSS-PLOTTING. Union Oil Co. of California, Los Angeles. For primary bibliographic entry see Field 8G.

IMPROVED DRILLING RATES AT LOWER

New South Wales Univ., Broken Hill (Australia). For primary bibliographic entry see Field 8C.

ELECTRIC AND THERMAL PROPERTIES OF ROCKS, U. I. Moisevenko, L. S. Sokolova, and V. Ye.

Istomin

Available from the National Technical Informa-Available from the National Technical Informa-tion Service as NASA TT F-671 \$3.00 in paper copy, \$1.45 in microfiche. NASA Technical Trans-lation, NASA TT F-671, February, 1972. 59 p, 17 fig, 10 tab, 70 ref. Translated from Elektricheskiye i Teplovyye Svoystva Gornykh Porod v Usloviyakh Normalnykh i Vysokikh Temperatur i Davleniy, Nauka Press, Siberian Novosibirsk, 1970.

Descriptors: *Boreholes, *Resistivity, *Electrical studies, Geology, Physics, *Geothermal studies, Electrical conductance, Conductivity, *Thermal conductivity, Heat, Sedimentary rocks, Igneous rocks

Identifiers: Lattice heat conductivity, Electron heat conductivity, Olivinite, Eclogite, Diorite, Aleurolite, Argillite.

Results are presented of a study of the electric conductivity of rocks under different thermodynamic conditions. The apparatus and methods used in measuring these parameters are described. Experiments for studying the effect of temperature, pressure, and the joint effect of these factors on rock resistivity are discussed, as well as the results of a study of the thermal properties of sedimentary and igneous rocks at temperatures from room temperature to 1,200-1,400C. The dependence of electric conductivity is given for unilateral pressures and with simultaneous heating to 600C and pressures greater than 30 kbar. The results of a study of the dependence of heat conductivity on temperature are discussed. Conclusions are drawn concerning the mechanism of electric and heat conductivity of rocks at high temperatures. (Staplin-NWWA) 74-07906

8F. Concrete

SOLID FORMS FOR SAVANNAH RIVER PLANT HIGH-LEVEL WASTE,
Du Pont de Nemours (E.I.) and Co., Aiken, S.C. Savannah River Plant. For primary bibliographic entry see Field 5D.

THE TECHNOLOGY OF TRITIUM FIXATION AND STORAGE, Battelle-Pacific Northwest Labs., Richland,

Wash.

For primary bibliographic entry see Field 5D. W74-07789

LIME GROUT PENETRATION AND AS-SOCIATED MOISTURE MOVEMENTS IN SOIL, Commonwealth Scientific and Industrial Research Organization, Melbourne (Australia). Div. of Applied Geomechanics For primary bibliographic entry see Field 8D. W74-07871

COMPENSATED GAMMA RAY DENSIMETER MEASURES SLURRY DENSITIES IN FLOW, Halliburton Services, Duncan, Okla. For primary bibliographic entry see Field 8G. W74-07877

USING IMPROVED TECHNOLOGY TO OBTAIN BETTER CEMENT JOBS ON DEEP, HOT LINERS.

Western Co., Dallas, Tex. A. Tragesser, and P. N. Parker. Journal of Petroleum Technology, Vol 24, No 11, p 1307-1313, November 1972. 3 fig. 8 tab, 9 ref.

Descriptors: *Cements, *Cement grouting, *Well casings, *Thermocline, Temperature, Compressive strength, Pressure, Oil wells, Drilling fluids, Slurries, Mud, Viscosity.

Identifiers: *Cement thickening time, *Spacers, API thickening time test, Curing pressure, Liners.

Performance requirements of cementing slurries for liner casings in deep, hot wells are even more critical than for full strings of casing. A laboratory and field study was made of factors affecting the success of cementing liners in Southwest Texas areas where previous experience was unsatisfactory. Cement slurries designed for deep wells are very sensitive to temperature. Accurate information is needed to obtain proper performance. The API schedule for testing oil-well cements is based on a measured static temperature and the calculated circulating temperature may differ substantially from the actual temperature. Significant variations exist between the bottom-hole circulattemperatures of oil-base and water-base drilling fluids. Certain oil muds cause severe gela-tion of cement slurries and can shorten thickening time. A spacer composition should be used that is compatible with both mud and cement. Standard laboratory tests on compressive strength made after short curing times at 3000 psi do not adequately represent compressive strength development under bottom-hole conditions of extreme pressure and temperature. Improved mud displacement can be achieved by maintaining viscosity of the cement slurry greater than that of the drilling fluid and by rotating the liner when cement slurry is being pumped up the annulus. (Gray-NWWA) W74-07878

GYPSUM-CEMENT BLEND WORKS WELL IN

PERMAFROST AREAS, Imperial Oil Ltd., Calgary (Alberta). N. M. Kljucec, A. S. Telford, and C. C. Bombardieri. World Oil, Vol 176, No 4, p 49-52, March, 1973. 6 fig, 2 tab, 6 ref.

Descriptors: Cements, *Cement grouting, *Permafrost, *Arctic, *Gypsum, *Canada, Cold regions, Ice, Frozen ground, Heat transfer, Thawing, Compressive strength, Shear strength.
Identifiers: "Gypsum-cement blend, Bond
strength, Arctic Islands, MacKenzie Delta, API
Class B cement, High-alumina cement.

Thermal behavior, compressive strength and the shear-bond strength against simulated permafrost were investigated for conventional oil-well ce-ments and for high-alumina and gypsum-cement blends. Class B cement slurry at 50 degrees F. placed in contact with simulated permafrost forplaced in contact with simulated permatrost for-mations maintained at 24 degrees F, quickly cooled and froze before hydration took place. When the Class B cement slurry was held at 50 degrees F. (by heaters) the sample set. Bonding to the formation was observed only against gravel. High-alumina cement generated enough heat in setting to sustain the setting reaction when the sample was placed in air at 20 degrees F. in 3 to 4 hours. Gypsum-cement blend mixed at 50 degrees F. and placed in frozen sand at 23 degrees F. set without significant change in temperature of the permafrost. Shear-bond strengths between cement and frozen gravel and sand formations were and riozen graver and said formations were satisfactory but bond was poor or lacking between cement and ice. Thermistor cables were strapped to the outside of surface casing strings on several wells in the Canadian Arctic. Temperatures measured during the waiting-on-cement period of surface casing indicated satisfactory setting of gyp-sum-cement blend. Conventional oil-field cement warm fluid in the casing set in the normal time.

(Campbell-NWWA) W74-07884

CORROSION RESISTANT CEMENTS. Prodorite Ltd., Surrey (England).

Anti-Corrosion, Vol 18, No 12, p 15-17, December, 1971. 3 fig, 1 tab.

Descriptors: *Cements, *Corrosion, *Chemical properties, *Compressive strength, Solvents, *Adhesion.
Identifiers: Ceramics, Resin-base cement, Hydraulic cement, Latex cement, Silicate cement, Sulphur cement.

Different types of corrosion-resistant cements are reviewed, including hydraulic cements, latex cements, silicate cements, sulphur cements, and resinous cements. The resin-based varieties are evaluated most extensively, according to the following parameters: compressive strength, tensile strength, adhesion to ceramic ware, temperature , resistance to sulphuric acid, resistance to hydrochloric acid, resistance to nitric acid, re-sistance to hydrofluoric acid, resistance to alkalis, and resistance to solvents. The products discussed are those most suitable for use in the bedding and jointing of ceramic units in floors, gutters, chan-nels, chimneys, tank and vessel linings of all types, walls, and similar construction. (Staplin-NWWA)

8G. Materials

THREE-DIMENSIONAL ZONE MODEL LOG INTERPRETATION,
Hawaii Univ., Honolulu. Water Resources

Research Center.

Research Center.
L. J. Shamey, and W. M. Adams.
Available from the National Technical Information Service as PB-232 157, \$3.00 in paper copy, \$1.45 in microfiche. Technical Report No 69, September 1973, 20 p, 1 fig, 2 tab, 4 ref. OWRR A-032-HI(1), 14-31-0001-3511.

Descriptors: *Resistivity, *Boundary conditions, Equations, Mud, Drilling fluids, *Electrical well logging, Logging(Recording), *Model studies, *Boreholes geophysics, Rock properties. Identifiers: Cylindrical zones.

To facilitate the interpretation of geophysical electrical well-logging data, the apparent resistivity has been calculated in a model in which the experimental situation is approximated by three coaxial cylindrical zones containing the drilling mud, cymmrca zones containing the utiling made, flushed rock, and surrounding rock matrix, respectively. This three-zone model is shown to yield results that differ by as much as 25 percent from the earlier two-zone model calculations. PROJECT RIO BLANCO SPALL MEASURE-MENTS DATA REPORT,

California Univ., Livermore. Lawrence Livermore Lab. For primary bibliographic entry see Field 4B. W74-07797

PREVENTION OF CALCIUM CARBONATE SCALE DEPOSITION IN MILL WATER SYSTEMS,
NL Industries, Inc., Houston, Tex. Baroid Div.

A. E. Beasley, and I. McKinney. Mining Engineering, Vol 25, No 3, p 32-37, March, 1973. 7 fig, 2 tab, 4 ref.

Descriptors: *Scaling, *Calcium carbonate, *Scale prevention, Water quality, Water reuse, Water softening, Quality control, Recirculated water, Sodium compounds, Treatment facilities, Copper. Identifiers: Sodium tripolyphosphate, Sodium hexametaphosphate, Lignosulfonates, Organic Organic Pentasodium *Mill aminotrimethylenephosphonate, water

Scale deposition can cause severe operational problems in copper concentrator water systems. A thorough investigation of the mill water system makes practical a chemical treatment to minimize the formation of calcium carbonate scale. Molecularly dehydrated phosphates, lignosulfonates, and, more recently, organic phosphonates can be used to achieve an effective scale control program at a reasonable cost. Co-mingling of various process waters is an important consideration in scale inhibition. Routine analyses of the waters and monitoring of scale formation on test coupons are es-sential to a satisfactory program. (Gray-NWWA) W74-07848

DOMESTIC WATER SYSTEMS, NONCHEMI-CAL FACTORS IN CORROSION CONTROL, Olin Corp. Stamford, Conn.

S. Sussman.

Materials Protection and Performance, Vol 12, No 4, p 38-42, April, 1973. 4 fig, 5 ref.

Descriptors: *Corrosion, *Corrosion control, *Potable water, Hardness(Water), Water softening, Ion exchange, Zeolites, Impaired water quali-

Identifiers: Water system design, *Water system operation, Hydraulic feeder.

Corrosion control in the domestic water systems of buildings has two major nonchemical con-straints: (1) The water must remain suitable for drinking, and (2) limitations are imposed by the design, construction, and operation of large, urban buildings. The building operator usually has no control over the composition of the entering water but control can be exercised over water-softening treatment practices to avoid creation of corrosive water by over-treatment. Such nonchemical factors in water system design as the choice of piping material, pipe sizing, hot water temperature controls, and maintenance facilities can have an important effect on corrosion. Unless the water system is properly operated and maintained, efforts to minimize corrosion may fail, even though the system is adequately designed. Maintenance personnel should be made aware of how their actions influence the development of corrosion in domestic water systems and they should be trained to take the steps necessary to minimize corrosion. (Gray-NWWA) W74-07849

DOMESTIC HOT WATER SYSTEMS, SIL-ICATE TREATMENT INHIBITS CORROSION OF GALVANIZED STEEL AND COPPER AL-

Illinois State Water Survey, Urbana. R. W. Lane, T. E. Larson, C. H. Neff, and S. W.

Field 8—ENGINEERING WORKS

Group 8G-Materials

Materials Protection and Performance, Vol 12, No 4, p 32-37, April, 1973. 1 fig, 12 tab, 7 ref.

Descriptors: *Corrosion, *Corrosion control, *Potable water, *Silicates, Copper, Copper alloys, Stainless steel, Inorganic compounds, Phosphates, Zinc. Hardness(Water), Alkalinity, Temperature, Distribution systems, Laboratory tests, Hydrogen ion concentration.

Identifiers: Galvanized steel, Zinc pyrosilicate, Zinc carbonate.

Laboratory test circuits were constructed on the basis of the design of the central domestic hot water systems in Illinois state institutions and produced approximately the same corrosive conditions that were found in tests on the larger systems. Corrosion tests were continued for 120 days. Results were evaluated in terms of the weight loss method, both 'descaled metal loss' and 'weight change' being examined. Types of waters studied were: (1) low hardness and alkalinity and low mineral content; (2) medium hardness and alkalinity and medium mineral content, and (3) blended hardness, high alkalinity and high mineral content. Based on the test results, a table was prepared as a guide to recommended treatment to inhibit corrosion of metals in domestic hot water at 140 degrees F and 180 degrees F. Silicate treatment generally was the most effective in inhibiting corrosion of galvanized steel and copper base metals. Zinc-phosphate formulations were considered acceptable inhibitors of copper bearing metals. The 90-10 copper nickel was much more resistant to corrosion than was copper. Stainless steel grade 409 was not sufficiently resistant to corrosion, because of seam and crevice corrosion, to be considered acceptable in domestic hot water systems. (Gray-NWWA) W74-07850

THE ELECTRICAL RESISTIVITY METHOD

(PART I), Keck Consulting Services, Inc., East Lansing, Mich.

For primary bibliographic entry see Field 7B. W74-07852

RECENT ADVANCES IN LOG EVALUATION, Schlumberger, Well Surveying Corp., Paris

R. L. Campbell, Jr.

World Petroleum, Vol 43, No 2, p 22-30, February, 1972. 9 fig, 16 ref.

geophysics. *Borehole Descriptors: *Logging(Recording), *Well logging, Lithologic logs, Subsurface investigations, *Well data, Computers, *Remote sensing.

Identifiers: Crossplots, Quantitative log interpretation, Moveable hydrocarbons.

Crossplotting of borehole geophysical data with the aid of large computers can be effective in determining reservoir properties such as lithology. clay content, effective porosity, water saturation, and the volume of movable hydrocarbons. The technique involves integrating the responses from neutron formation density, sonic, and resistivity logs to give an analog display of the lithology and reservoir parameters of the zone of interest. The data obtained can be used to develop optimum casing and perforation programs that will maximize production rates. A disadvantage of the technique is that the large computers required to integrate the data are not available at the well site. However 'quick-look' schemes have been developed that allow rapid and accurate detection of water saturation, movable hydrocarbons, porosity, and lithology at the well-site. (Hunt-NWWA) W74-07853

PERFORMANCE AND SELECTION OF MATERIALS FOR POTABLE HOT WATER

Air Force Inst. of Tech., Wright-Patterson AFB. I R Myers and M F Obrecht

Materials Protection and Performance, Vol 12, No 4, p 17-23, April, 1973. 19 fig, 1 tab, 11 ref.

Descriptors: *Corrosion, *Corrosion control, Copper, *Copper alloys, *Potable water, Hardness(Water), Water softening, Carbon dioxide, Oxygen, Temperature, Zeolites, Stainless steel. Identifiers: *Thermoplastic pipe.

Premature erosion-corrosion failures have occurred in copper tubes of circulating, potable hot water systems of large buildings, especially when the waters were 'soft' and contained dissolved oxygen and carbon dioxide. An extensive test program assessed erosion-corrosion damage from micrometric wall-thickness measurement, weight loss, and radiographic studies. Results are presented graphically in a form to allow the design/corrosion engineer to select materials and operating conditions which will provide erosion-corrosion free systems for conveying most potable cold and hot water supplies in buildings. General recommendations are offered. Copper tube should be used to convey potable waters at temperatures to 140 degrees F and velocities to 4 feet per second. Above 140 degrees F, 90-10 cupro-nickel should be used. Admiralty brass can also be used to convey corrosive waters in the temperature range of 140 to 170 degrees F. Tanks for potable hot water should be glass lined. Carefully con-trolled chemical treatment of the water may be useful (Gray-NWWA)

TRACERS IN MUD IMPROVE DST, WIRELINE

TEST ACCURACY, Chevron Oil Co., Denver, Colo.

B. B. Cooley. World Oil, Vol 175, No 2, p 40-44, August 1, 1972.

Descriptors: *Tracers, *Nitrates, *Drilling fluids, Nitrogen compounds, Salts, Water analysis, Colorimetry, Mud. Identifiers: *Drillstem tests, *Wireline tests, Sodium nitrate, Ammonium nitrate, Potassium nitrate.

Field examples are cited to illustrate the use of

nitrate ion as a tracer of filtrate from the drilling fluid in order to determine the source and type of water recovered on drill stem and wireline tests. Because nitrate ion is rarely present in saline formation waters, the presence of even a few parts per million in water recovered on a formation test indicates contamination by nitrate from the nitrate-treated drilling mud. The usual treatment consists of adding five pounds of ammonium, sodium or potassium nitrate to each 100 barrels (4200 gallons) of drilling mud. A simple colorimetric test is made on the mud filtrate. Subsequently nitrate analysis of water recovered on tests will in-

dicate the extent of contamination by mud filtrate. Major mud suppliers have been licensed by Chevron Oil Co. to offer the service. (Gray-NWWA) W74-07856

COUPON CORROSION RATES VERSUS HYDROGEN PROBE ACTIVITY,

Fincher Engineering Co., Houston, Tex. D. R. Fincher, A. C. Nestle, and J. J. Marr. Presented at The International Corrosion Forum Devoted Exclusively to the Protection and Per-formance of Materials, March 4-8, 1974, Chicago,

Illinois, 19 p. 6 fig. 4 tab.

Descriptors: Corrosion, *Corrosion control, Wells, Monitoring. Identifiers: *Corrosion rates, Corrosion monitoring, *Hydrogen probe activity, *Coupon corrosion Methods of corrosion rate measurement, corrosion detection, and corrosion control monitoring are discussed. These methods are categorized into the following general groups: (1) the study of equipment performance records, (2) visual inspection of shut down equipment, (3) non-destructive testing (4) analysis of corrodents and corrosion products samples, (5) use of sentinel holes, and (6) corroding specimens. These techniques have proven to be of relative value only because they depend upon a weight/surface dissolution rate which often assumes uniform rather than local corrosion. Variables such as velocity, pressure, temperature, exposure time and location are known to directly control corrosion rate but their effect has not been quantitatively defined by these methods. Three gas wells were monitored for corrosion and data were gathered pertaining to coupon corrosion rates, iron content of the produced water, and hydrogen probe activity. A strong cor-relation was found between the corrosion rates in each of the three wells and the hydrogen probe activity. (Martino-NWWA) W74-07857

NEW BROMIDE PACKER FLUID CUTS CORROSION PROBLEMS, Dow Chemical Co., Midland, Mich. Halogens

Research Lab.

J. H. Plonka. World Oil, Vol 174, No 5, p 88-89, April, 1972. 4

Descriptors: Corrosion, Chemical properties, *Corrosion control, Solutes, *Calcium chloride. Identifiers: *Calcium bromide, *Packer fluids, Completion fluids.

A new low corrosion, solids-free calcium bromidecalcium chloride brine solution can be mixed to weights of 12-15 ppg for use as a fluid behind packers or as a completion fluid. Other substances previously used for these purposes have serious drawbacks: mud suspensions can be weighted sufficiently, but their high solids content can cause major problems; zinc chloride brine, the only other solids-free fluid used above 11.6 ppg, is corrosive in high density ranges. In addition, the calcium bromide-calcium chloride solution is not damaging to the ecology, and it is compatible with other additives. (Campbell-NWWA) W74-07858

DISSOLUTION OF A POROUS MATRIX BY A SLOWLY REACTING ACID,

Fluor Corp. Ltd., Houston, Tex. For primary bibliographic entry see Field 8B.

FINDING ANSWERS TO PROBLEMS, CORROSION

Carpenter Technology Corp., San Diego, Calif. M. Henthorne.

Chemical Engineering, Vol 79, No 7, p 97-100, April 1972. 1 fig, 3 tab, 21 ref.

Descriptors: *Corrosion, Deterioration, *Corrosion control, Coatings, Paints, Metallurgy, Materials, On-site investigations. Identifiers: *Inspection, *Early detection, Laboratory investigations. Unexpected failures

Early detection of corrosion through scheduled inpacition is very effective in averting costly failures and loss of production. Unexpected failures that do occur are commonly the result of one or more of the following: poor choice of materials, operating conditions different than those anticipated, defective fabrication, improper inadequate maintenance, or materials. The importance of onsite and laboratory investigations of unexpected failures is emphasized. Checklists are given that outline the procedures to be followed for each of these investigations. Corrosion data for material selection

can be obtained from such sources as textbooks, journals, metals producers, company files, technical societies, and consultants. Future trends in corrosion control will be directed toward improv-ing material and fabrication techniques and im-proving protection techniques. (Martino-NWWA) W74-07863

VARIATIONS IN THE DESIGN OF DEPTH SAMPLERS FOR USE IN GROUNDWATER

STUDIES, Institute of Geological Sciences, London (England). Dept. of Hydrogeology.

T. K. Tate. Water and Water Engineering, Vol 77, No 928, p 223. June 1973. 2 fig.

Descriptors: *Wells, *Water wells, *Groundwater, Descriptors: "Wells, "Water Wells, "Coroundwater, *Sampling, Water analysis, Quality control, Chemical analysis, Remote control. Identifiers: *Depth samplers.

Depth samplers permit sampling of groundwater, particularly from water supply boreholes at predetermined depths below the surface of the water. This approach to sampling is especially important when chemical variation occurs in the column of water in the borehole, rendering a pumped sample unrepresentative. Sampling in production boreholes often presents difficulties of limited access, due to the presence in the borehole of the pump and rising main, together with cables to the pump and ancillary equipment. Small diameter samplers with a smooth outline are thus needed. Different varieties of this type of water sampler and their methods of use are reviewed. (Campbell-NWWA) W74-07865

EFFECTS OF SOUTHERN

CALIFORNIA POTABLE WATERS,
Southern California Metropolitan Water District, Los Angeles

Materials Pr ection and Performance, Vol 12, No 4, p 43-48, April 1973. 7 fig, 3 tab, 4 ref.

Descriptors: Corrosion, *Corrosion control, *Potable water, Stainless steel, Copper, Copper alloys, Colorado River, *Colorado River anoys, Colorado River, *Colorado River Aqueduct, Zinc, Laboratory tests, *California, Water supply. Identifiers: *Corrosome

Delta(Calif), Monel.

Two surface water supplies furnish about 40% of the total quantity used in southern California: (1) 'orado River and (2) the Sacramento Delta water treatment includes clarification, filtration, and chlorination, although partial softening is applied to portions of the Colorado River water. The corrosion rates of these waters were measured by the 'electric coupon' method on the metal alloys commonly used in plumbing materials. Corrosion rates in the range of 9 to 21 mils per year were found on 1010 carbon steel and zinc. Corrosion rates for copper, low zinc brasses, and bronzes are in the range of 2 to 3 m.p.y. Monel and stainless steel are virtually corrosion resistant in these potable waters. The corrosion rates may decrease somewhat when the lower mineralized water from the California aqueduct system is delivered. (Campbell-NWWA) W74-07866

CASING POTENTIAL LOGGING RELATED TO VERTILOG CORROSION LOGGING, AMF Tuboscope, Inc., Grand Rapids, Mich.

R. A. Lindsey.
Presented at The International Corrosion Forum Devoted Exclusively to the Protection and Performance of Materials, March 4-8, 1974, Chicago, Illinois. 6 p, 4 fig.

Descriptors: *Borehole geophysics, *Corrosion logging, Electromagnetic flux leakage.

A new wire line technique used to detect corrosion pitting damage to downhole tubular steel is discussed. This technique, called electromagnetic flux leakage, utilizes the fact that any pipe wall anomaly causes the lines of magnetic flux being conducted through the pipe to be interrupted. Corresponding interruptions occur in the electrical field associated with the magnetic flux, and these electrical signals are sent to the surface and later interpreted. Drastic changes in current patterns are shown to be related to pipe wall anomalies.
(Martino-NWWA) W74-07868

DRILL PIPE FAILURES: WHERE DO WE GO FROM HERE

Continental Oil Co., Ponca City, Okla.

P. Mehdizadeh.

Petroleum Engineer, Vol 45, No 10, p 52-70, September 1973. 6 fig, 2 tab.

*Fatigue(Mechanics), Descriptors: Failure(Mechanics), *Corrosion, Rotary drilling, Drilling equipment, Drilling, Drilling fluids, Mud, Wells, Tensile stress, Washouts, Corrosion con-

Identifiers: *Drill pipe, *Tool joints, I fatigue, American Petroleum Institute RP7G. Notch

Service problems of drill pipe and tool joints are tabulated and discussed briefly according to mode of failure, causes, and preventive measures to be taken. Problems caused by inadequate design or improper downhole operations nowadays are rela-tively rare as compared with problems resulting from mishandling prior to entering the hole. Problems arising from fatigue and corrosion fatigue account for about 90% of drill string failures. Corrosive agents that may enter the drilling fluid are oxygen, hydrogen sulfide and carbon dioxide. Sources, estimated reduction in fatigue strength of pipe, and approaches to mitiga-tion of corrosion of these substances are tabu-lated. Suggestions are offered on the care and maintenance of drill strings. (Campbell-NWWA) W74-07869

WAYS TO IMPROVE YOUR WELL COMPLETIONS, Institut Français du Petrole, Rueil-Malmaison

R. Desbrandes. World Oil, Vol 174, No 5, p 71-74, April 1972. 2 fig. 41 ref.

Descriptors: *Logging(Recording), *Borehole geophysics, *Electrical well logging, *Radioactive well logging, *Borehole cameras, *Lithologic logs, Subsurface investigations.
Identifiers: Well completion,

Acoustic logs, Borehole television.

Improved formation evaluation, more efficient perforating jobs and higher well productivities are resulting from recent advances in wireline tools. New engineering methods now being applied in the field include: logging methods for controlling sand production; techniques for evaluating elements such as carbon, aluminum and silica in borehole rocks; detection of casing tension failures in steam injection wells; through-tubing formation logs and production tools; and techniques for obtaining cleaner, deeper perforations for higher well flow. Specialty devices discussed include radar logging Specially devices discussed include radar logging tools, sidewall acoustic logging devices, magnetic casing logging tools, a 1 3/4-inch borehole televiewer, an electromagnetic perforator orientation device, and CORIBAND analysis units. (Staplin-NWWA) INFLUENCE OF WATER QUALITY ON THE CORROSION AND ELECTROCHEMICAL BEHAVIOR OF MILD STEEL IN SYNTHETIC ACID MINE WATERS,

Department of Energy, Mines and Resources, Ottawa (Ontario).

D. V. Subrahmanyam, and G. R. Hoey. Presented at The International Corrosion Forum Devoted Exclusively to the Protection and Performance of Materials, March 4-8, 1974, Chicago, Illinois. 17 p, 8 fig, 3 tab, 20 ref.

Descriptors: *Corrosion, *Corrosion control, *Acid mine water, *Electrolysis, Physicochemical properties, Mining, Metallurgy, Water quality. Identifiers: *Mild steel, Corrosion rates, *Ionic species, Electrochemical behavior, Type 1010 mild steel.

The results of investigations on the influence of ionic species on the corrosion and electrochemical behavior of Type 1010 mild steel in synthetic acid mine waters are presented. These results show that: (1) in synthetic acid mine waters, the corrosion rates are increased significantly by ferric and cupric ions; (2) the corrosion rate is directly pro-portional to the ferric ion reduction rate; (3) the corrosion of mild steel is predominantly under the control of diffusion controlled cathodic reduction steps, (4) the weight loss and Tofel extrapolation methods of determining corrosion rates of mild steel in various waters agrees within 30%, (5) polarizing the mild steel to a potential of -1000 mpy to 30 mpy in solutions containing ferric ions, and (6) copper complexing did not inhibit copper deposition or minimize the corrosion rate. (Martino-NWWA) W74-07876

COMPENSATED GAMMA RAY DENSIMETER MEASURES SLURRY DENSITIES IN FLOW.

Haliburton Services, Duncan, Okla. R. J. Guest, and C. W. Zimmerman. Petroleum Engineer, Vol 45, No 10, p 80-87, Sep-tember 1973. 5 fig, 6 ref.

Descriptors: *Density, *Slurries, *Cements, *Drilling fluids, *Gamma rays, Radiation, Well

drilling, Grouting.

Identifiers: *Gamma ray densimeter, Compensated densimeter, Mass absorption coefficient, Photon energy, Hydraulic fracturing, Scintillation

A gamma radiation detector consisting of a scintil-lation crystal, a photomultiplier tube, and appropriately designed shielding, makes practical a compensated densimeter that is but little influenced by the constituents of the slurry. The density indication for the full range of slurry constituents normally pumped in oilfield service is within plus or minus 0.25 pound per gallon of true density. If the constituents are limited to those normally used in drilling muds, density indications are made to within plus or minus 0.1 pound per gal-lon of true density. Measurement of the density of the slurry under pressure eliminates uncertainties caused by entrained air. In drilling operations, the densimeter transducer inserted in the standpipe is capable of sustained operation at 4000 psi. The returns densimeter transducer is mounted on a skid with a pump to circulate the mud. The instrument package is installed near the driller's console and displays and records the densities. The standpipe and returns density readouts can be corre-lated with pressure and other data to interpret a wide range of well bore conditions. In cementing operations the densimeter instrument package is installed near the cementing operator to provide a continuous visual indication of density. A permanent record is provided also. Tests are in progress on the use of the densimeter in hydraulic fracturing to measure sand concentration. (Campbell-NWWA) W74-07877

Field 8-ENGINEERING WORKS

Group 8G-Materials

CORROSIVE EFFECTS OF POTABLE WATER,

Denver Water Dept., Colo.
R. C. Randolph, and D. A. Lincoln.
Materials Protection and Performance, Vol 12, No 4, p 25-27, April 1973. 1 fig, 1 tab.

Descriptors: *Corrosion, *Corrosion control, *Potable water, *Stainless steel, *Filters, Copper alloys, Screens, Pitting(Corrosion), Filtration, Sands, Screens, Treatment facilities. Identifiers: *Microstrainers, Rapid sand filters

Two examples are cited of corrosion by potable water in the Marston Treatment Plant of the Denver Water Department: (1) Type 304 stainless steel microstrainer screens, and (2) galvanized steel piping in a rapid sand filtration system. The first major installation in the United States of stainless steel microstrainer screens was made in tion cost is estimated at \$3.58 per million gallons. After seven years of operation, pinholes were noted in the microstrainer fabric. The following year, algae and turbidity appeared in the finished water and several of the microstrainer drums were judged to be inoperable. A study of the cause of failure showed that the major source of trouble was crevice corrosion initiated by oxygen starva-tion and depassivation of the Type 304 stainless steel. The badly corroded panels were replaced by Type 316 steel. Alcoholic phosphoric acid was used in cleaning and washwater flow was increased. The treatment appears to be successful after three years. The rapid sand filtration unit was installed in 1964. Although provision had been made to insulate between the red bronze and the galvanized steel segments of the system, serious corrosion of the galvanized steel occurred. Coating with mastic and replacement by red brass are the treatments in progress. (Gray-NWWA) W74-07886

CORROSION RESISTANT CEMENTS. Prodorite Ltd., Surrey (England). For primary bibliographic entry see Field 8F. W74-07887

CORROSION RESISTANCE OF PIPING AND

CONSTRUCTION MATERIALS, Engelhard Industries, Inc., Newark, N.J. P. N. Cheremisinoff, I. Fideli, and N. P. Cheremisinoff

Pollution Engineering, Vol 5, No 8, p 23-26, Au-

Descriptors: *Corrosion, Pitting, Cavitation, Fatigue, *Corrosion control, *Materials, Specifications, Design, Metals, *Alloys, Chemicals. Identifiers: Clarkson, *Acidic solutions, Metallic corrosion, Non-metallic corrosion.

Corrosion is deterioration or decay occurring when a material reacts with its surroundings or the fluid being transported or contained. It may either uniform, where the material corrodes at the same rate over the entire surface, or localized with only small portions affected. Twelve types of corrosion are described. Most construction materials are expected to undergo some type of corrosion. Therefore, it becomes important to determine what effects chemicals in an environmental system will have on materials. Careful analysis must be made of effluents, and existing piping and construction materials should also be examined and compared. The following factors influencing the extent of corrosion should be considered: (1) concentration of major constituents being handled; (2) pH of effluent; (3) temperature of effluent; (4) degree of aeration (limited aeration may enhance certain types of corrosion); (5) velocity of the fluid stream in the transport system; (6) inhibitors; and (7) startup and downtime procedures Numerous construction materials, metallic and non-metallic are available for pipe and tanks. Physical properties should be thoughfully examined before any final selection is made. Tables are presented as a general guide to proper selection. (Hunt-NWWA)

CAUSES AND PREVENTION OF DRILL PIPE TROUBLES

Armco Steel Corp., Houston, Tex. R. L. Vingoe

Drilling, Vol 33, No 6, p 22-24, April, 1972. 10 fig.

Descriptors: Rotary drilling, Drilling fluids, *Failure(Mechanics), *Buckling, *Cracks, *Pitting(Corrosion), *Fatigue(Mechanics), Hydrogen ion concentration, *Corrosion control.
Identifiers: Internal corrosion fatigue, *Corrosion fatigue, Yield point, Critical rotary speeds, Fatigue cracks, *Pipe bending, Nodal vibration, Pendulum vibration.

Corrosion fatigue and the bending of drilling pipe are the two major problems that drilling contractors face. Corrosion fatigue begins with pitting of the pipe surface and progresses to fatigue cracking in the final stages, where each crack roots along the former pits. This process is accelerated by (1) exceeding a stress level of 90,000 psi during drilling, (2) drilling in corrosive formations, and (3) driling, (2) drilling in corrosive formations, and (3) allowing the pH of the drilling fluid to drop below 9.5. Four performance guidelines for preventing corrosion fatigue are given: (1) plastic coating of inside and outside walls of pipe, (2) keeping pipe under tension during service, (3) minimizing slip damage or other notch and gouge markings, (4) maintaining the pH of the drilling mud at 10.5 or higher Raphe in drill pine occur when the grifical higher. Bends in drill pipe occur when the critical rotary speed is exceeded for a given drilling depth. The relationships of critical rotary speeds with pipe size and hole depth for the two types of vibrations responsible for pipe bending, i.e. nodal and pendulum vibrations, are described. The use of stronger drill pipe with a higher yield point can reduce the amount of pipe bending due to drill pipe whipping. (Martino-NWWA)
W74-07889

CORROSION BY WATERS, Union Carbide Corp., New York. C. P. Dillon.

Materials Protection and Performance, Vol 12, No 4, p 49, April, 1973.

Descriptors: *Corrosion, *Corrosion control, *Boiler feedwater, Water quality, Stainless steel, Carbon dioxide, Oxygen, Metal pipes. Identifiers: *Sodium sulfite.

Untreated aerated water is corrosive to steel, and more resistant materials of construction required in industrial service. Most industrial problems arise from inadequate attention or downright abuse of the utilities. Improperly deaerated boiler feedwater, for example, may result from substitution of ordinary sodium sulfite for catalyzed sodium sulfite in a steam plant designed for the latter product. Piping design should prevent the inadvertent introduction of untreated makeup water. Adequate control of water chemistry sometimes is neglected when steam is generated from boiler feedwater in converters or waste heat boilers. Low carbon dioxide content and absence of oxygen is required if stream condensate is to be handled in steel pipes. Stainless steel is needed for badly contaminated condensate. Wrought iron, or a high-strength, low alloy steel may be adequate for condensate of intermediate quality. (Gray-NWWA) W74-07890

LEARN THE BASICS OF CORROSION CON-J. D. Palmer

Canadian Chemical Processing, Vol 56, No 1, p 45-48, January, 1972.

Descriptors: *Corrosion control, *Deterioration, Electrolysis, Metallurgy, Rusting, Saline water, Stainless steel, Control.

Identifiers: *Corrosion engineering, *Materials en-gineer, Corrosion characteristics, Material selec-

The application of modern corrosion engineering principles that rely heavily on material science represents the most efficient means of combating corrosion. Classically, the term corrosion has been restricted to the deterioration of metals by elec-trochemical reactions. Modern corrosion engineering involves a detailed analysis of the types of corrosion that can occur in virtually every natural and artificial environment, as well as an understanding of the corrosion characteristics of all metallic and non-metallic materials. In designing a successful corrosion control program the corrosion engineer must consider the following parameters: cost, corrosion behavior, weldability and solderability, forming characteristics, mechanical properties, availability, compatability, thermal and electrical characteristics, and magnetic characteristics. (Staplin-NWWA) non-metallic materials. In designing a successful W74-07892

EVALUATION OF SCALING TENDENCIES.

G. B. Hatch.

Materials Protection and Performance, Vol 12, No 4, p 49-50, April, 1973. 4 ref.

Descriptors: *Scaling, *Calcium carbonate, *Hardness(Water), Calcium sulfate, Solubility, Saturation, Crystallization, Cooling water, Supersaturation, Heat exchangers, Carbon dioxide.
Identifiers: *Metastable solutions, *The *Thermal Identifiers: precipitation.

Calcium carbonate, as calcite or aragonite, is the scale most commonly found in water systems. Several factors should be considered before undertaking the operation of cooling water systems in the metastable solution range of calcium carbonate. Metastable limits are poorly defined. Moderately supersaturated solutions will remain stable indefinitely in the absence of solid surfaces that can serve as nuclei for crystalization. Relief of supersaturation can be quite slow even in the presence of the solid phase. The solubility of calcium carbonate decreases in the temperature range of cooling waters (25-95C). Thermal precipitation of calcium carbonate generally is the result of this retrograde solubility-temperature behavior. Loss of carbon dioxide from bicarbonate waters is not an essential factor in precipitation. Numerous solid surfaces, such as ferric oxide, accelerate the deposition of calcium carbonate from supersaturated solutions. Flow rate is another factor. Control tests must be made to determine the degree of staturation of calcium carbonate and deposition tests can be made through test heat exchangers. (Gray-NWWA) W74-07893

ZINC/PHOSPHATE COMBINATIONS TROL CORROSION IN POTABLE WATER DIS-TRIBUTION SYSTEMS, Virginia Chemicals, Inc., Portsmouth, Va.

T. E. Kelly, M. A. Kise, and F. B. Steketee. Materials Protection and Performance, Vol 12, No 4, p 28-31, April 1973. 14 tab.

Descriptors: *Corrosion, *Corrosion control, *Potable water, Hydrogen ion concentration, Inor-ganic compounds, *Phosphates, Sulfur compounds, Distribution systems, Laboratory tests, *Zinc, Water quality, Pitting(Corrosion). Identifiers: Zinc sulfate, Sodium dihydrogen phosphate, Sulfamic acid, 1010 steel.

Laboratory and field experience indicated that corrosion inhibitors based on zinc salts and orthophosphate salts reduced corrosion of 1010 steel coupons about 85% in waters from Virginia. New Jersey, New York and a New England area.

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The usual concentration in the treated water was 1 Ine usual concentration in the treater water was ppm of zinc (Zn) and 0.88 ppm of phosphate (PO4). Zinc sulfate, sulfamic acid and sodium dihydrogen phosphate were generally used. Sulfuric acid can be substituted for sulfamic acid, and other salts of zinc can be used. Inhibitor concentrations are governed by the corrosivity of the water involved. Good results have been obtained at a cost of \$1.80 per million gallons but in very corrosive waters costs may range as high as \$7.20 per million gallons. Treatment costs may be offset by reduction in chemical costs for post-coagulation pH adjustments because the zinc/phosphate inhibitor functions over a wide range in pH. A commercial preparation of suitable composition has been approved for drinking water, provided that the con-centrations of selected ions do not exceed the limits published in U.S. Drinking Water Standards. (Gray-NWWA) W74-07894

SOLVING DRILLING PROBLEMS UTILIZING WELL LOGS - A CASE HISTORY, Continental Oil Co., Houston, Tex. A. M. Zanier, D. J. Timku, and T. L. Myers. In: 13th Annaul Logging Symposium Transactions, Society of Professional Well Log Analysts, 7-10 May, 1972, Tulsa, Oklahoma, paper W, 9 p, 11 fig. 1 cm.

Descriptors: Geophysics, *Borehole geophysics, *Logging(Recording), *Wells, Oil wells, Drilling fluids, Drilling equipment, Subsurface investigations, *Remote sensing, *Oklahoma. Identifiers: Differential pressure sticking, Formation pressure, Formation damage.

Severe drilling problems have been encountered in Wilburton Field, Oklahoma. Some of these problems are related to variations in formation pressures throughout the area. Well logs can be used effectively to determine pressure profiles. In this field, overpressures and underpressures are present. Correct mud weights and casing point selections are vital to drilling the wells efficiently and economically. Drilling rate varies depending on the degree of differential pressure of the drilling fluid to the formation pressure. Such differential pressure can cause pipe stricking, circulation losses and formation damage. Also, negative differential pressure creates potential blowout conditions. Techniques were developed using logs to determine fluid pressures in the Spiro producing interval and overpressured adjacent shale interval. Charts have been designed and are presented to be used for the pressure calculations. (Hunt-NWWA)

POROSITY-RESISTIVITY CROSS-PLOTTING, Union Oil Co. of California, Los Angeles. W. H. Lang, Jr. In: 13th Annual Logging Symposium Transac-

tions, Society of Professional Well Log Analysts, May 7-10, 1972, Tulsa, Oklahoma, paper F, 10 p, (1972), 10 fig, 5 ref.

Descriptors: *Aquifer characteristics, Porosity, *Resistivity, Mathematics, *Graphical methods, Electric logs, *Hydrologic data, Equations. Identifiers: Formation evaluation, *Formation factors, Water saturation.

Quantitative formation evaluation has depended on the Humble or modified Archie equations as the generally accepted Formation factor-porosity relations. Recent work by others indicates that dif-ferent average relations may be more applicable. It appears, however, that no worldwide average relation accurately fits a specific reservoir rock. The porosity-resistivity cross-plotting technique is in-dependent of a, m, Rw and other formation con-stants. If a statistically significant number of points of a given rock type with a constant Rw can be plotted, it becomes possible to accurately ob-tain a quantitative evaluation of that rock. Further, the correct formation constants for that particular formation in that part of a particular geologic basin can be derived from the finished porosity-resistivity plot. As in any method formation evaluation, the analysis of a single log in any 'unexplored' basin may lead to errors which are not readily apparent to the inexperienced log analyst. As evidence is gathered in a geologic sequence in a basin, or, ideally, in a single formation in a field, the Formation factor-porosity equation can be determined that most accurately fits the rocks in question. (Hunt-NWWA) W74-07900

THE SULFATE-REDUCING BACTERIA AND OILFIELD BACTERIAL CORROSION - A REVIEW OF THE CURRENT STATE-OF-THE-ART.

Superior Oil Co., Houston, Tex G. B. Farquhar.

Presented at The International Corrosion Forum Devoted Exclusively to the Protection and Performance of Materials, March 4-8, 1974, Chicago, Illinois, 13 p, 2 fig, 1 tab, 49 ref.

Descriptors: *Corrosion, *Anaerobic bacteria, *Sulfate-reducing bacteria, Bacteria, Microorgan-

isms, *Reviews.

Identifiers: *Oilfield bacterial corrosion, Desul-

The role of sulfate-reducing bacteria in the corro-sion of mild steel is discussed. Early investigators attributed anaerobic corrosion to: (1) bacterial utilization of the cathodic hydrogen by the enzyme hydrogenose, (2) the formation of concentration cells, and (3) anodic stimulation by the ferrous sulfide formed by the bacteria. More recent work has shown quite conclusively that: (1) the corrosivity of sulfate-reducing bacteria is principally due to their ability to produce iron sulfide, (2) the soluble iron content of the growth media is the most im-portant factor controlling their rate of corrosion, and (3) the bacterial utilization of the cathodic hydrogen does not contribute significantly to the corrosion process. (Martino-NWWA) W74-07902

RESEARCH -- TARGETS AND DEVELOP-MENTS, REGIONAL ASSESSMENTS, Newcastle Univ. (Australia). Dept. of Physics. For primary bibliographic entry see Field 7B. W74-07903

GALVANIC EFFECTS INCREASE CORRO-SION, PART 2, J. D. Palmer.

Canadian Chemical Processing, Vol 56, No 2, p 36, 38-39, February, 1972. 5 fig, 3 tab.

Descriptors: *Corrosion, Pitting, Anodes, Cathodes, Chemical reactions, *Cathodic protection, Films, Stainless steel, *Electrochemistry.
Identifiers: *Galvanic effects, *Galvanic series,
Electrochemical cell, Cell potential, Standard potential.

An understanding of relative electrochemical potentials is vital in minimizing corrosion wherever two or more different metals come into contact with one another. Describes are the characteristics of the electrochemical cell, and the cell action that takes place either locally on the surface of a single piece of metal, or between electrically interconnected pieces of different metals. The role of dissolved oxygen in solution is explored. Measuring cell potential is explained, and the role of the sacrificial anode to save steel from corroding is emphasized. Only corrosion at approximately amtemperatures is discussed. (Campbell-W74-07904

THE HYDROGEOLOGY AND UTILIZATION OF BRINES IN EL SALADO, CHILE, Birmingham Univ. (England). Dept. of Geology.

For primary bibliographic entry see Field 4A. W74-07936

TWO NEW DRILLING SYSTEMS PASS INITIAL FIELD TESTS, DC ELECTRIC POWER SWIVEL CAN SAVE TIME AND MONEY; HYDRAULIC SNUBBER BUILT TO OPERATE IN RUGGED TERRAIN.

World Oil, Vol 174, No 1, p 35-43, January, 1972. 9

Descriptors: Wells, *Drilling, *Drilling equipment, Well drilling, Offshore platforms, *Oil industry,

Identifiers: *Hydraulic snubber unit. *Electric powered swivel, Automatic pipe racking system, Wireline retrievable bit.

Two new concepts in drilling equipment have been built and are designed to operate with maximum personnel safety and well control, using only three-man crews. Main components of the system are a 750 continuous hp DC electric powered swivel and a hydraulically powered snubber unit capable of handling drill pipe and casing. An automatic pipe racking system that will handle from one joint to one stand of pipe at a time can be used with either method. Also, a wireline retrievable bit will allow either system to drill with casing. The DC powered swivel will be especially applicable for use on many current electrically powered rigs. Large land units and many offshore rigs already are equipped with adequate generator and switchgear capacity to operate the unit. The drilling snubber unit is a specialty tool designed for use on remote locations. Because of its light overall weight and design, the snubber can be disas-sembled into small loads, comparable to mast, prime mover, BOP and mud system components, for complete transportation by helicopter. (Campbell-NWWA) W74-07980

8H. Rapid Excavation

PROJECT RIO BLANCO SPALL MEASURE-MENTS DATA REPORT,

California Univ., Livermore. Lawrence Livermore Lab. For primary bibliographic entry see Field 4B. W74-07797

PREVENTION OF DAMAGE TO PIPELINES. National Transportation Safety Board, Washington DC For primary bibliographic entry see Field 8A. W74-07923

8I. Fisheries Engineering

LABORATORY REARING EXPERIMENTS ON ARTIFICALLY PROPAGATED (STENODUS LEUCICHTHYS),

Alaska Univ., College. Dept. of Biology J. D. LaPerriere.

Available from the National Technical Informa-tion Service as PB-232 141, \$4.50 in paper copy, \$1.45 in microfiche. Alaska Institute of Water Resources, Fairbanks, Report No IWR-40. June, 1973, 25 p. 7 fig, 4 ref. OWRR A-041-ALAS(2). 14-31-0001-3802.

Descriptors: *Fish hatcheries, Arctic, *Alaska, Photoperiodism, Daphnia, Shellfish, Algae, Brine shrimp, *Fish farming, Fish food organisms, *Fish

Identifiers: *Inconnu, Oregon mash, Stenodus leucichthys, Selenastrum sp.

During the period of ice cover 1972-1973 the gravling thermal tolerance experiments in Interior Alaska were interrupted by the unavailability of

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these fish. In collaboration with the Alaska Department of Fish and Game it was decided to use the experimental set-up to attempt to rear Inconnu (Stenodus leucichthys) in controlled conditions. Two temperatures (5C and 8C) and four feeds (freeze dried Daphnia, freeze dried brine shrimp nauplii, Oregon mash, and cultured algae, mainly Selenastrum sp.) were used as treatments. No sig-nificant difference was found between treatments due to heavy mortality. Papers by a Russian worker Karzinkin and Chilikov seemed to explain our heavy mortality. A photoperiod of 24 hours of light has been found necessary for successful rearing of Inconnu young. W74-07725

EXPERIMENTS TO RE-ESTABLISH HISTORI-CAL OYSTER SEED GROUNDS AND TO CON-TROL THE SOUTHERN OYSTER DRILL, Louisiana Wild Life and Fisheries Commission,

New Orleans. Div. of Oysters, Water Bottoms and Seafoods. J. F. Pollard.

Available from the National Technical Informa-tion Service as COM-73-11171. Technical Bulletin No 6, January 1973. 82 p. 29 fig, 8 tab, 33 ref. 2-90-R PI 88-309

Descriptors: *Commercial shellfish, *Oysters, *Aquiculture, *Louisiana, Monitoring, Management, Marshes, Saline water intrusion, Parasitism, Planting management, Salinity, Water temperature, Water chemistry, Spawning, Estuaries, Economics, Deltas, Hydrologic properties. Identifiers: *Oyster seed grounds, Southern oyster drill, Cultch plantings, Spatfall.

Cultch planting programs and fresh water diver-sion activities were studied in order to enhance production of oysters, Crassostrea virginica, in Louisiana. Various materials were screened for oyster cultch with clamshell found to be the most suitable. Two methods of planting cultch were evaluated and the preferable conditions are outlined. Plankton sampling to monitor oyster larvae in the water column and the use of spat-catching devices to monitor spatset were employed to determine periods and peaks of oyster spawning activity. The delineation of the infestation by the Southern oyster drill and its historical movement were discovered and methods for its control are discussed. Plankton sampling revealed the seasonal distribution of drill larvae in the water column, which extended from May through September and peaked in July or August. Trawl and dredge sampling gauged the effects of or compiled base line data on existing and proposed fresh water diversions intended to depress the salinity regimen of the area, and also project probable alterations in the area. Salinity and water temperatures were intensively monitored to outline the seasonal regimens of both parameters and a less intensive study of additional water chemistry parameters was accomplished. (Auen-Wisconsin) W74-07982

A WATER QUALITY PROBLEM IN LOBSTER HOLDING TANKS, Rhode Island Univ., Kingston. Marine Advisory

T. L. Meade.

Available from the National Technical Information Service as COM-73-11886, \$2.75 in paper copy, \$1.45 in microfiche. Marine Memorandum Series No 31 (undated). 3 p. 1 ref.

Descriptors: *Storage tanks, *Water quality, *Lobsters, Water temperature, Mortality, Ammonia, Toxicity, Nitrates, Dissolved oxygen, Nitrification.
Identifiers: *Lobster holding tanks.

While refrigeration is used to maintain desirable temperatures in lobster holding tanks, nevertheless high mortalities occurred from midsummer to early autumn in some shore holding facilities coin-

ciding with maximum surface water temperatures and relatively high percentages of newly moulted lobsters in the catch which are under greater stress than their heavily shelled counterparts and require more oxygen. Water quality was implicated as a possible cause of the high mortality. Water is sometimes recirculated longer than desirable with the result that weak and dead lobsters remain in some tanks for excessive periods. Water samples were analyzed for ammonia five hours after introduction of fresh seawater. The following morning samples averaged 3.7 ppm ammonia and from the same tanks six hours later, 4.8 ppm. Forty-two hours later ammonia ranged from 9.2 to 14 ppm; concentrations greater than 10 ppm probably are unsafe. The apparent solution was the installation of additional refrigeration tonnage and, possibly, insulation of the holding tanks. An alternative was to encourage the development of marine nitrifying microorganisms that would convert the toxic ammonia to less toxic nitrate. (Jones-Wisconsin) W74-07983

THE BIOLOGY AND ECOLOGY OF RIVER CARPSUCKER, CARPIODES CARPIO (RAFINESQUE), IN THE LITTLE MISSOURI ARM OF LAKE SAKAKAWEA, NORTH ARM OF LAKE SAKAKAW DAKOTA, North Dakota Univ., Grand Forks.

For primary bibliographic entry see Field 2H. W74-07991

ANADROMOUS FISHES OF LAKE PONCHAR-TRAIN AND ITS TRIBUTARIES, Louisiana Wild Life and Elics,

For primary bibliographic entry see Field 2H. W74-07993 New Orleans.

THE EFFECTS OF THE MARYLAND HYDRAU-LIC CLAM DREDGE ON POPULATIONS OF THE SOFT-SHELL CLAM, 'MYA ARENARIA,' Maryland Dept. of Research and Education, Solomons. Chesapeake Biological Lab. H. T. Pfitzenmeyer.

H. 1. PHtzenmeyer. Available from the National Technical Informa-tion Service as COM-73-11006, \$6.00 in paper copy, \$1.45 in microfiche. National Marine Fisher-ries Service Report No. NOAA-73052501, April 1972. 77 p. 22 fig, 21 tab. 3-93-R. PL 88-309.

Descriptors: *Harvesting, *Chesapeake Bay, *Clams, *Dredging, Reproduction, Particle size, Juvenile growth stage, Shellfish, Estuarine fisheries, Spawning, Commercial fishing, Mortality, Sediments, Growth rates, Potomac River. Identifiers: *Mya arenaria.

Effects of seasonal and intermittent hydraulic clam dredging upon survival and growth of remaining populations and annual recruitment of juvenile soft-shell clams were determined in Chesapeake Bay and the Potomac River. Physical and chemical changes in substrates altered by dredging were evaluated. Population densities of sub-legal soft-shell clams were not significantly reduced by dredge harvesting legal-sized clams. Populations of legal-sized clams sampled four months after the March or June dredging were not significantly different from densities in undredged areas. August dredging resulted in significantly different population densities until 8-12 months later. Initial setting was not greater in dredged areas, but recruitment was not greater in dredged areas, but recruitment of young clams increased where adult populations were reduced. No differences in survival or recruitment were observed in plots dredged daily and weekly. Growth rates did not appear to vary in dredged and undredged plots. No major changes in sediment grain size were detected after dredging. The marketable population of soft-shell clams in dredged plots averaged 5 clams per square foot at the beginning of the June 1969 experiment; at the termination of the investigation in December 1971, average density was .05 clams. (Jones-Wisconsin) W74-07994 MOLLUSCAN MORTALITY STUDIES, Maryland Dept. of Natural Resources, Annapolis,

S. V. Otto. S. V. Otto. Available from the National Technical Informa-tion Service as COM-73-11891/1, \$5.50 in paper copy, \$1.45 in microfiche. National Marine Fishe-ries Service Report NOAA-73101017, August 1973. 68 p. 5 append. 3-131-R. PL 88-309.

Descriptors: *Animal diseases, *Mollusks, *Mortality, *Chesapeake Bay, Oysters, Animal parasites, Clams, Commercial shellfish, Protozoa, *Mollusks, Distribution, Aquiculture, Breeding, Reproduc-

Identifiers: Minchinia nelsoni. Dermocystidium marinum, Manokin River(Md.), Ciliated thig-motrichs, Amoebiasis, Ovacystis, Neoplasia, Tagelus plebius, Vibrio anguillarum.

Determination was made of the ranges, prevalence, and intensities of the major economically deleterious parasites and diseases affecting the several species of molluscan shellfish found in Chesapeake Bay and its tributaries. Oyster samples were collected and examined quarterly from the eight natural bars and four raft-caught spat planted bars in the Manokin River. Hard clams were sampled monthly, soft clam sampling was conducted during May-October 1971, and razor clams were examined on an irregular basis.

Manokin River field work in spatfall monitoring and off-bottom spat capture studied economically feasible methods of development and management of the oyster resource in mass seed capture and transplantings. In setting areas, off-bottom cultch is far superior to on-bottom cultch as far as density is concerned. Gill infections caused by the probably commensal organism, ciliated this-motrichs, were found in 461 oysters. Amoebiasis was found in 15 oysters in the April 1970 sample. Excluding the Manokin River, 22 oysters were found with ovacystis, and 11 cases of neoplasias. Hard clam and soft clam parasite distribution studies were made. Mortality and infection rates of oyster stock in a non-enzootic area was compared with stock from an enzootic area. (Jones-Wisconsin) W74-07995

THE APPLICATION OF 'ROTENONE' FOR THE EXTERMINATION OF THE INDIGENOUS

THE EXTERMINATION OF THE INDIGENOUS FISH STOCK IN WATERS WHERE INTENSIVE FISH FARMING IS TO BE INTRODUCED, 1. Mihajlovic, and V. Rajevski. Available from the National Technical Information Service as TT 72-56039, \$3.00 in paper copy, \$1.45 in microfiche. Bureau of Sport Fisheries and Wildlife Translation TT 72-56039, 1973, 7 p. Translated from Ribarstvo, Vol 6, 1960.

Descriptors: *Fish control agents, *Rotenone, *Fish stocking, Fish farming, Piscicides, Application methods, Aquatic life, Toxicity. Identifiers: Serbia.

National economic considerations offer a primary rationale for the introduction of fish farming into appropriate bodies of water, including all types of reservoirs and drainage networks. Fish farming requires a radical clearing of existing indigenous fish and the introduction of those fish species best suited to the hydrochemical and hydrobiological conditions of a specific location. Rotenone is a specific fish poison if used in prescribed concentrations, and fish poisoned with Rotenone may be safely eaten. Fisheries research stations of the PR of Serbia carried out experiments in the application of so-called semi-pond farming on the Opovacki Dunavac at Pancevacki Rit. Rotenone opovacki Dunavac at Pancevacki Kii. Rotenone was chosen as a means of clearing the location both for practical and experimental purposes. Tests were performed of the effects of Rotenone on carp in aquaria. It was decided to clear one-half acre of water and up to 2 m deep with Rotenone as a test of its efficiency. A concentration of 0.025 mg/l of pure Rotenone proved to be quite suffi-cient. Biological analysis carried out early in the

spring did not reveal any harmful effects to aquatic organisms. (Jones-Wisconsin) W74-08001

EFFECT OF ORGANIC AND INORGANIC FER-TILIZERS ON THE GROWTH AND DEVELOP-MENT OF JUVENILE CARP IN SPAWNING PONDS, (IN RUSSIAN),

For primary bibliographic entry see Field 5C.

W74-08124

STUDY OF MESH FISH BARRIERS IN THE POLDER SYSTEMS OF THE NEMUNAS RIVER DELTA, (IN RUSSIAN).

Akademiya Nauk Litovskoi SSR, Vilnius. Institut

Zoologii i Parazitologii. A. P. Rimidis, and K. S. Gaigalas.

Rybn Khoz. 9, p 29-31, 1972.

Ryon Rioz. 9, 23-31, 1972. Identifiers: Deltas, *Fish barriers(Mesh), Polder systems, Rivers, *USSR(Nemunas River delta), *Fish migration.

The design, operating properties, and retaining capacity of semimechanized mesh fish barriers constructed in 1969 near the water-pumping plant of the polder system of the Nemunas delta (USSR) are presented. With the existing stream velocities the use of the barrier with 6 x 6-mm mesh makes it possible to avoid the mass annihilation by the pumps of not only the downstream-migrating stocks of valuable fish species from the embanked areas but also a considerable number of juveniles.--Copyright 1973, Biological Abstracts, Inc. W74-08125

ACCLIMATIZATION OF INTRODUCED FISH SPECIES IN THE ERAVNINSK LAKES (BURYAT ASSR), (IN RUSSIAN), A. I. Demin.

Izv Biol-Geogr Nauchno-Issled Inst Irkutsk Univ.

24. p 181-192, 1971.

Identifiers: Acclimatization(Fish), *Bream, Buryat-Assr, *Carp(Amur), Coregonus-Albula-Ladogensis, Fish species, Lakes, *Ripus, *USSR(Buryat ASSR), *Walleye.

Bream from Lake Ubinskoe, the Amur common carp, and the Ural 'ripus' (Coregonus albula ladogensis) and European walleye were introduced in the Eravinsk lakes (USSR). The results of the establishment of these species are presented. The bream, 'ripus', carp, and walleye survived under local water conditions. To increase their populations it is necessary to provide a denser stocking, to conduct complex reclamation of the bodies of water, and to accelerate the construction of a spawning-rearing farm. Copyright 1973, Biological Abstracts, Inc. W74-08129

RESULTS AND PROSPECTS OF INVESTIGAT. ING FISHES AND THEIR FOOD RESOURCES OF THE KHATANGA RIVER BASIN, (IN RUS-SIAN), F. V. Luk'yanchikov.

Izv Biol-Geogr Nauchno-Issled Inst Irkutsk Univ.

24, p 127-134. 1971.

Identifiers: Commercial fish, Fishes, *Fish morphology, River basins, *USSR(Khatanga River basin), Fish foods.

The morphology and biology of fishes of the Khatanga river (USSR) basin and their food resources are described. The current use of fish stock and measures that were developed to increase the population of commercial fishes are given. The problems of further use of the fishes of the basin are defined .-- Copyright 1973, Biological Abstracts, Inc. W74-08130

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

ANNUAL REPORT '72 - '73.

Hawaii Univ., Honolulu. Water Resources Research Center.

Available from the National Technical Information Service as PB-232 016, \$7.75 in paper copy, \$1.45 in microfiche. 1973. 92 p. OWRR A-999-HI(9)

Descriptors: Water Resources Research Act, Hawaii, Water quality, *Colleges, Runoff, Sedimentation, Water reuse, Waste water disposal, Landfills, Water supply, Irrigation, Reservoir design, Radioactive well logging, Isotope studies, Urban hydrology, *Water Resources Institute, *Universities, *Training, *Grants.

The Office of Water Resources Research allotment and matching grant programs provided a firm base for about one-third of the University of Hawaii Water Resources Research Center's research effort. Projects directed toward evaluation of runoff and sediment contributions to quality of surface waters included A-018-HI, A-027-HI, and A-030-HI. Wastewater reclamation potential was evaluated in A-018-HI and A-036-HI. In A-040-HI the pollution potential of sanitary landfill leachate was assayed. Projects directed toward water sufficiency included A-030-HI, concerning the patterns and trends of water demand in southern Oahu; A-031-HI, comparing drip to sprinkle irrigation; and modeling studies of infiltration, water demand, and optimal use of small reservoir systems in A-035-HI, A-037-HI, and A-038-HI, respectively. Radiation well logging and calibration techniques for that work were studied in A-032-HI and A-034-HI. Isotopic means of evaluating water age and movement was researched in B-030-HI. A new rain gage was developed and utilized in B-028-HI. Simulation of urban hydrology and water distribution system design were the objectives of B-028-HI and B-029-HI, respectively. (Knapp-USGS) W74-07602

WATER RESOURCES RESEARCH IN VIR-GINIA - ANNUAL REPORT FOR FISCAL YEAR

Water Resources Research Center, Virginia Polytechnic Inst. and State Univ., Blacksburg. For primary bibliographic entry see Field 9D. W74-07842

THE ROLE OF WATER RESOURCES RESEARCH IN THE ENERGY CRISIS, Office of Water Resources Research, Washington,

For primary bibliographic entry see Field 6D. W74-07966

INDUSTRIAL LIQUID WASTE SURVEYS:

TRAINING MANUAL.
Environmental Protection Agency, Cincinnati,
Ohio. Water Quality Office. For primary bibliographic entry see Field 5G. W74-07988

9C. Research Facilities

ACTIVE RESEARCH TASKS REPORT-FISCAL YEAR 1973.

National Environmental Research Center, Cincinnati. Ohio.

For primary bibliographic entry see Field 5G. W74-07651

9D. Grants, Contracts, and Research Act Allotments

ANNUAL REPORT '72 - '73.

Hawaii Univ., Honolulu. Water Resources Research Center.
For primary bibliographic entry see Field 9A.

W74-07602

ACTIVE RESEARCH TASKS REPORT-FISCAL **YEAR 1973.**

National Environmental Research Center, Cincinnati, Ohio.

For primary bibliographic entry see Field 5G. W74-07651

WATER RESOURCES RESEARCH IN VIR-GINIA - ANNUAL REPORT FOR FISCAL YEAR

Water Resources Research Center. Virginia Polytechnic Inst. and State Univ., Blacksburg. Available from the National Technical Information Service as PB-232 243 \$4.00 in paper copy, \$1.45 in microfiche. Bulletin 72, February 1973, 105 p. OWRR A-999-VA(18).

Descriptors: *Water resources institute, *Grants, Colleges, *Universities, *Virginia, Training, *Education, *Research and development, Research facilities.

A summary of the research program carried out by the Virginia Water Resources Research Center for fiscal year 1972 is presented. Research on ten annual allotment programs and six matching grant programs is described. W74-07842

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

PART I - A CONCEPTUAL MODEL FOR A TERRESTRIAL ECOSYSTEM PERTURBED WITH SEWAGE EFFLUENT, WITH SPECIAL REFERENCE TO THE MICHIGAN STATE UNIVERSITY WATER QUALITY MANAGE-MENT PROJECT; PART II - A PERSONALIZED BIBLIOGRAPHI C RETRIEVAL PACKAGE FOR RESOURCE SCIENTISTS,

Michigan State Univ., East Lansing. Dept. of Fisheries and Wildlife. For primary bibliographic entry see Field 05D. W74-07606

MERCURY IN THE ENVIRONMENT, AN EPIDEMIOLOGICAL AND TOXICOLOGICAL APPRAISAL.

For primary bibliographic entry see Field 05C. W74-07680

CAPACITY OF WATER-BASED RECREATION SYSTEMS PART I: THE STATE OF THE ART -A LITERATURE REVIEW, North Carolina State Univ., Raleigh, Dept. of

Recreation Resources Administration For primary bibliographic entry see Field 06B. W74-07719

ENVIRONMENTAL RADIOACTIVITY,

New York Univ. Medical Center, N.Y. Inst. of Environmental Medicine. For primary bibliographic entry see Field 05B. W74-07791

Field 10—SCIENTIFIC AND TECHNICAL INFORMATION Group 10C—Secondary Publication And Distribution

PHREATOPHYTES, A BIBLIOGRAPHY, REVISED.
Office of Water Resources Research, Washington, D.C.
For primary bibliographic entry see Field 03B.
W74-07829

10F. Preparation Of Reviews

MERCURY IN THE ENVIRONMENT, AN EPIDEMIOLOGICAL AND TOXICOLOGICAL APPRAISAL. For primary bibliographic entry see Field 05C. W74-07680

CAPACITY OF WATER-BASED RECREATION SYSTEMS PART I: THE STATE OF THE ART - A LITERATURE REVIEW.
North Carolina State Univ., Raleigh. Dept. of Recreation Resources Administration.
For primary bibliographic entry see Field 06B.
W74-07719

ENVIRONMENTAL RADIOACTIVITY, New York Univ. Medical Center, N.Y. Inst. of Environmental Medicine. For primary bibliographic entry see Field 05B. W74-07791

SUBSURFACE EXPLORATION AND SAM-PLING OF SOILS FOR CIVIL ENGINEERING PURPOSES, Army Engineers, Waterways Experiment Station, Vicksburg, Miss. For primary bibliographic entry see Field 08D. W74-07905

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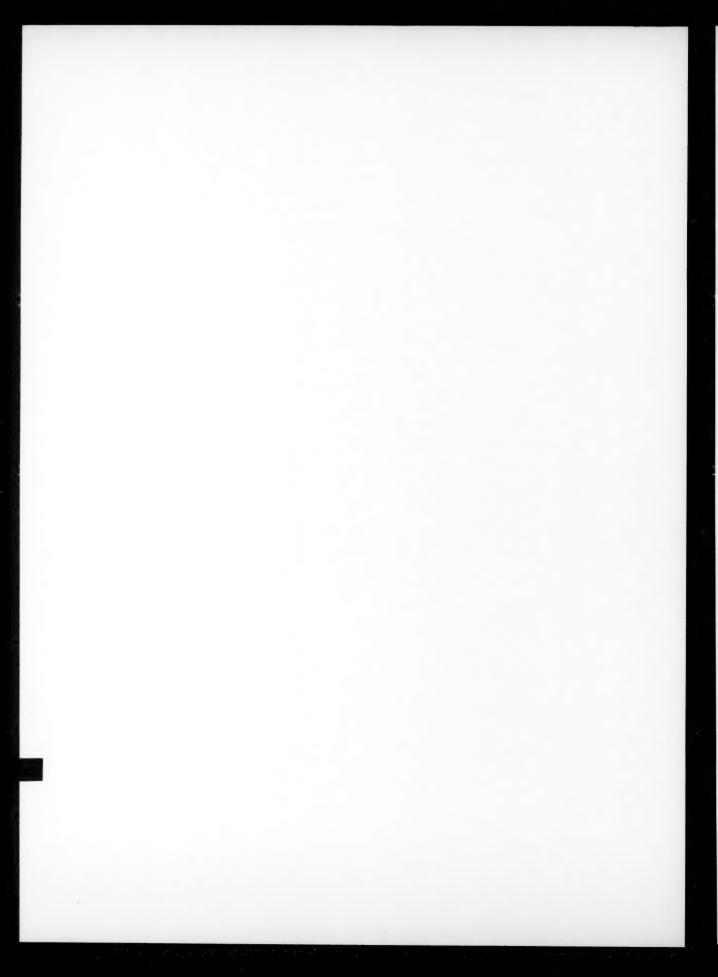
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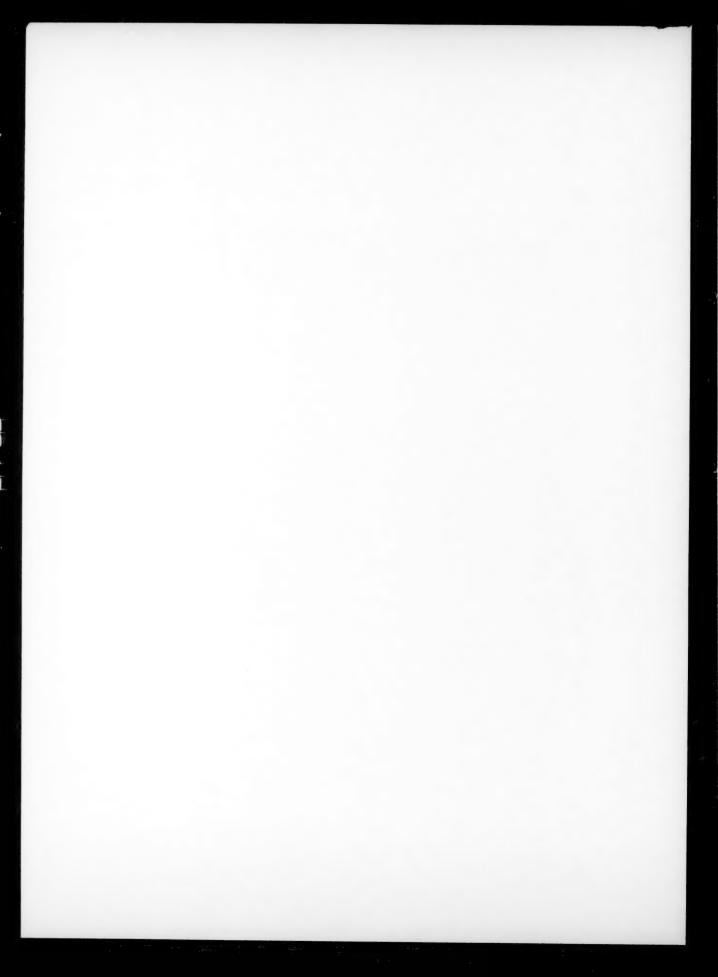
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A.	Centers of Competence		
	AEC Oak Ridge National Laboratory, Nuclear Radiation and Safety	W74-07780 - 07825	46
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	North Carolina Water Resources Research Institute	W74-07719	1
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	Pennsylvania Institute for Research on Land and Water Resources	W74-07612	1
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C. Other (Con't)		
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Office of Saline Water	W74-08061 - 08070	10
Office of Water Resources Research	W74-07601, 07714 07720 07724	8



CENTERS OF COMPETENCE AND THEIR SUBJECT COVERAGE

- Ground and surface water hydrology at the Water Resources Division of the U. S. Geological Survey, U. S. Department of the Interior.
- Metropolitan water resources planning and management at the Center for Urban and Regional Studies of University of North Carolina.
- Eastern United States water law at the College of Law of the University of Florida.
- Policy models of water resources systems at the Department of Water Resources Engineering of Cornell University.
- Water resources economics at the Water Resources Center of the University of Wisconsin.
- Eutrophication at the Water Resources Center of the University of Wisconsin.
- Water resources of arid lands at the Office of Arid Lands Studies of the University of Arizona.
- Water well construction technology at the National Water Well Association.
- Water-related aspects of nuclear radiation and safety at the Oak Ridge National Laboratory.
- Water resource aspects of the pulp and paper industry at the Institute of Paper Chemistry.

Supported by the Environmental Protection Agency in cooperation with WRSIC

- Effect on water quality of irrigation return flows at the Department of Agricultural Engineering of Colorado State University.
- Agricultural livestock waste at East Central State College, Oklahoma.
- Municipal wastewater treatment technology at the Franklin Institute Research Laboratories.

Subject Fields

- NATURE OF WATER
- WATER CYCLE
- WATER SUPPLY AUGMENTATION 3 AND CONSERVATION
- WATER QUANTITY MANAGEMENT AND CONTROL
- WATER QUALITY MANAGEMENT AND PROTECTION
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